United States Department of Agriculture

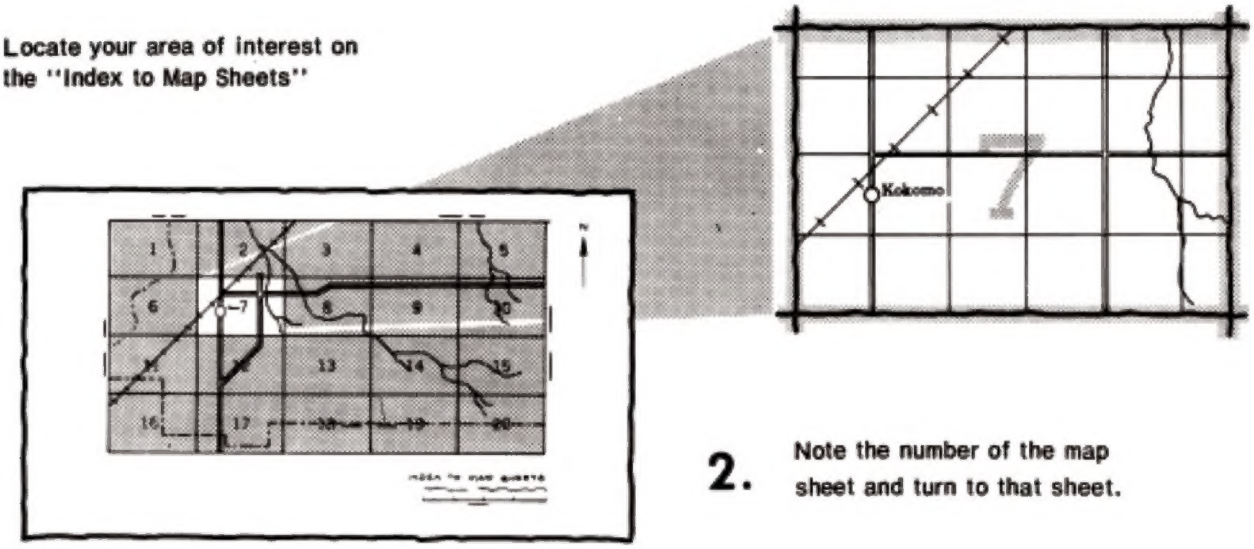
Soil Conservation Service

In cooperation with Colorado Agricultural Experiment Station; United States Department of the Interior, Bureau of Land Management; and Saguache County

Soil Survey of Saguache County Area, Colorado

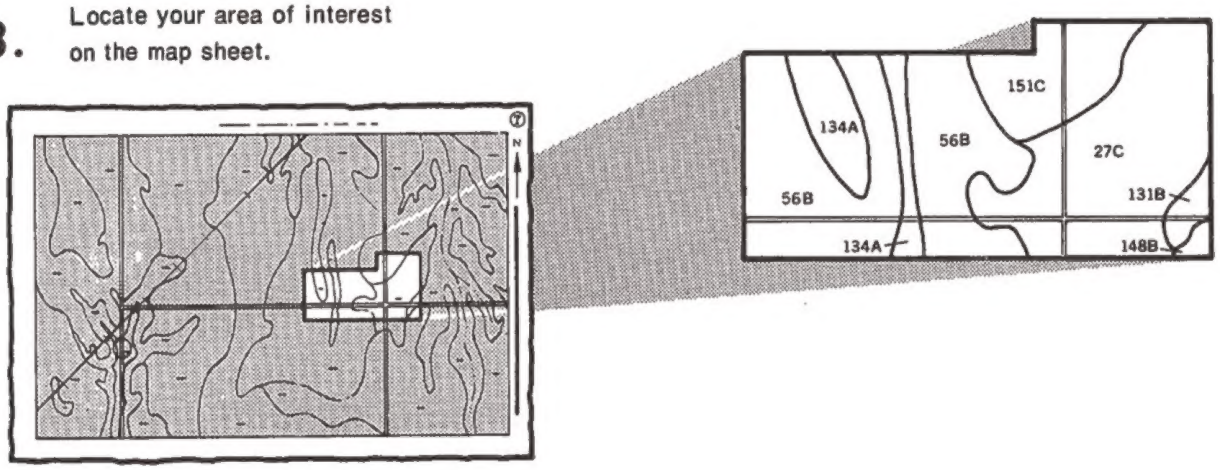
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

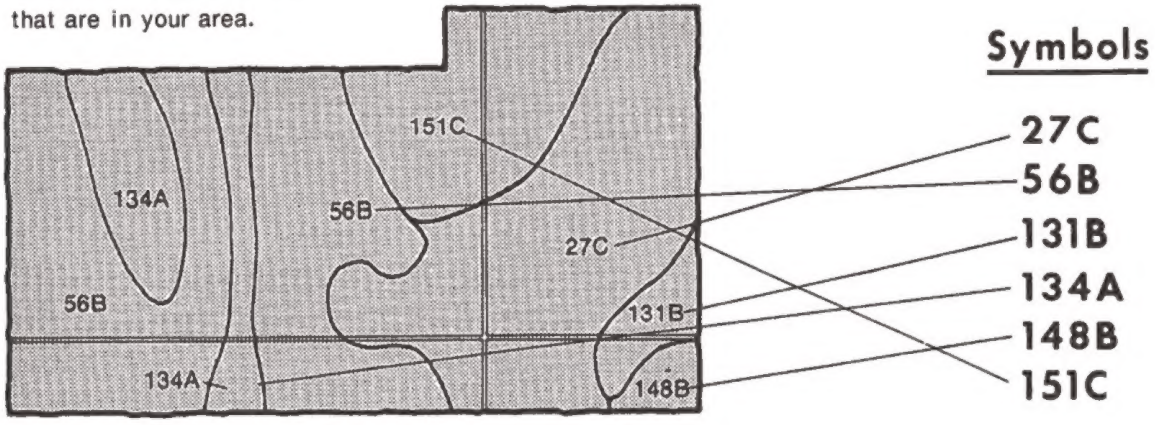


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

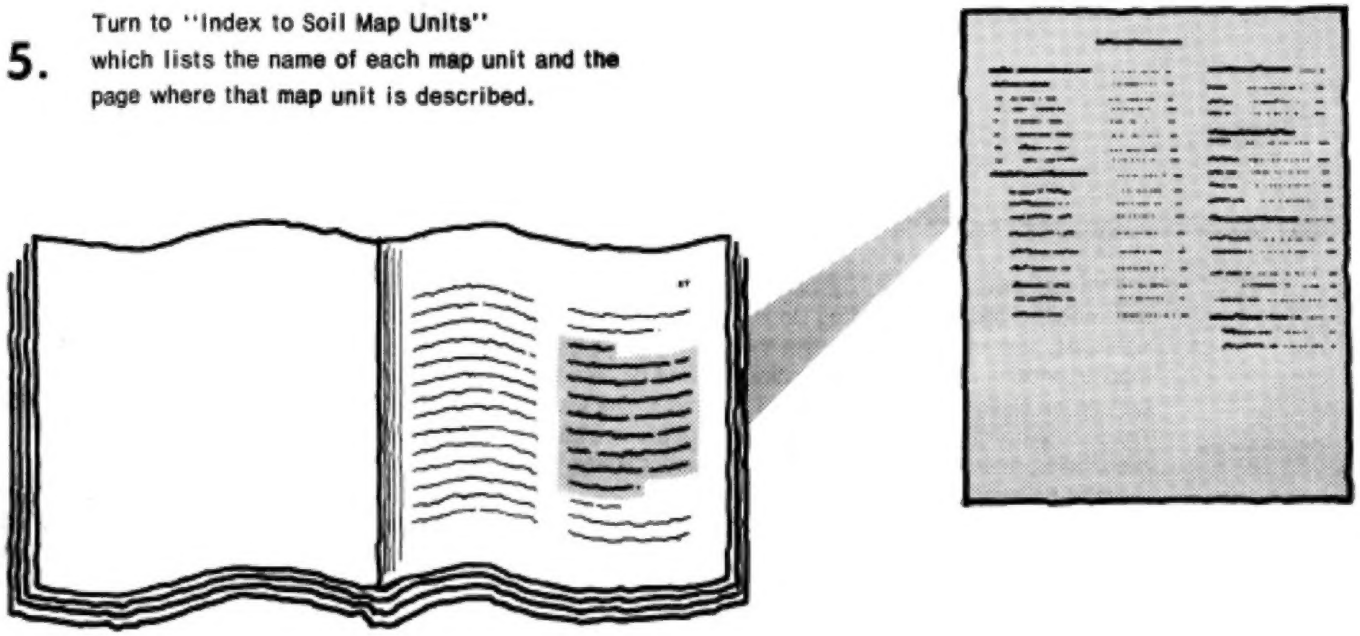


4. List the map unit symbols that are in your area.

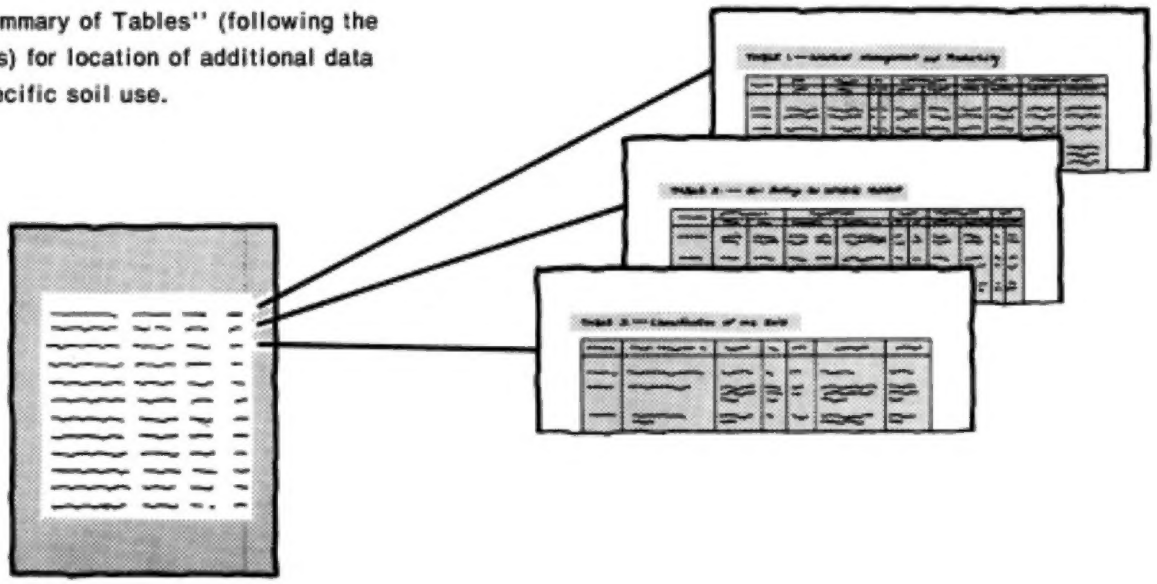


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1975-1980. Soil names and descriptions were approved in 1981. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1980. This survey was made cooperatively by the Soil Conservation Service; the Colorado Agricultural Experiment Station; the United States Department of the Interior, Bureau of Land Management; and Saguache County. It is part of the technical assistance furnished to the Center Soil Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Wagon tracks on Old Stage Coach Route and Toll Road near La Garita. The tracks were made in basalt on Rock outcrop, steep.

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Soil Series

Issued November 1984

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Summary of Tables

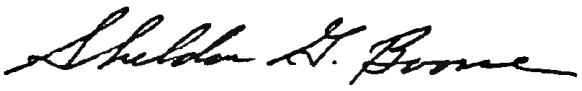
Foreword

This soil survey contains information that can be used in land-planning programs in Saguache County Area. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

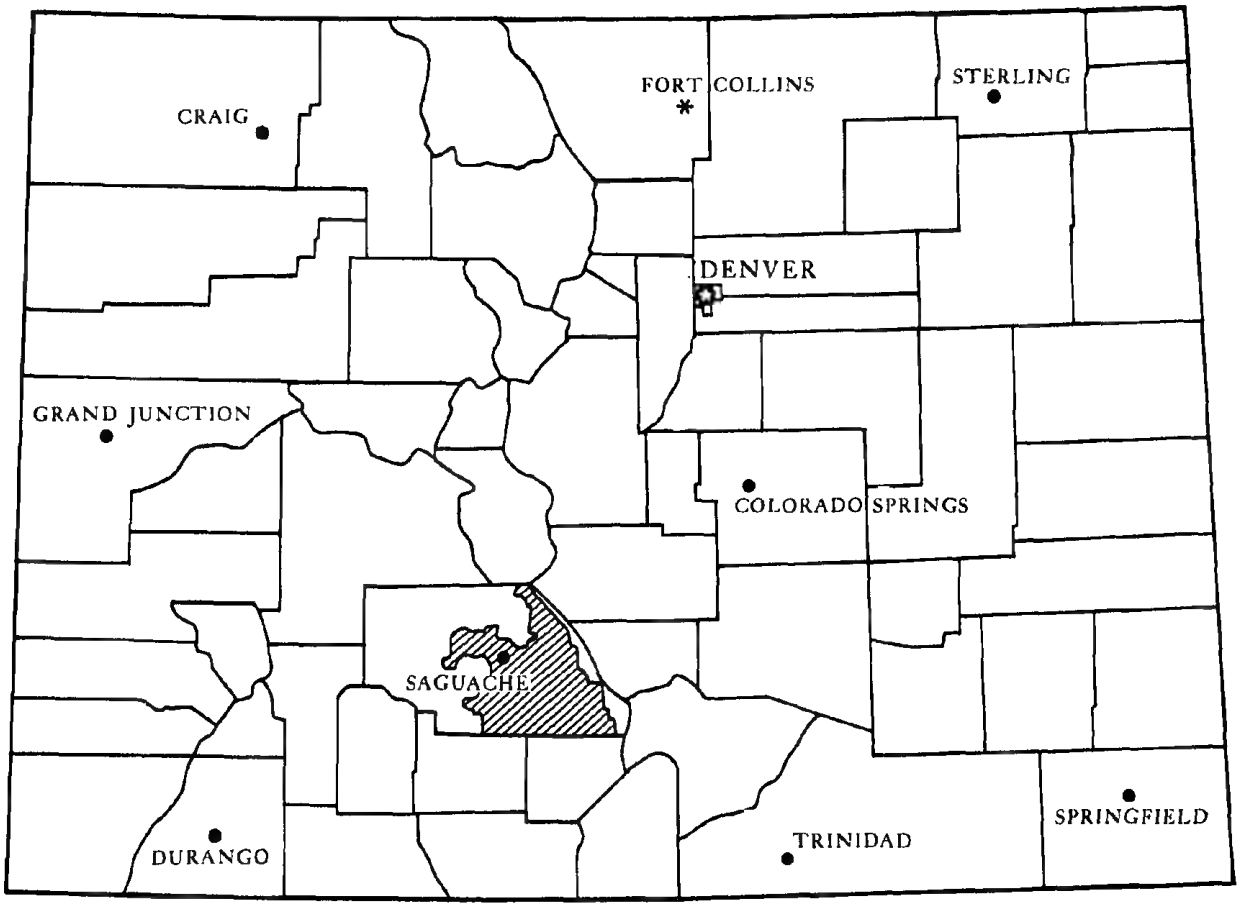
This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.



Sheldon G. Boone
State Conservationist
Soil Conservation Service



Location of Saguache County Area in Colorado.

Soil Survey of Saguache County Area, Colorado

By James M. Yenter, Soil Conservation Service

Soils surveyed by James M. Yenter, Jessie P. Rossbach, Michael L. Petersen, Kenneth J. Radek, and William P. Tripp, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
in cooperation with
Colorado Agricultural Experiment Station;
United States Department of the Interior,
Bureau of Land Management; and Saguache County

The Saguache County Area consists of the east-central part of Saguache County east of the Continental Divide. It is in the San Luis Valley of south-central Colorado. The survey area covers 908,160 acres, or about 1,419 square miles. A large part of the area is on the nearly level valley floor, where the elevation is about 7,600 feet. Elevation rises to about 14,000 feet along the crest of the Sangre de Cristo Range to the east and to about 10,000 feet along the San Juan Mountains to the west. The area is drained from the west by Saguache, Carnero, and LaGarita Creeks and from the north by San Luis Creek. Many small creeks originating in the Sangre de Cristo Range to the east drain into San Luis Creek. The streams drain into the south-central part of the area, which lies within a closed basin and has a high water table, is high in salt and alkali, and has no external drainage (fig. 1). The Great Sand Dunes National Monument covers about 27,000 acres in the extreme southeast corner of the area. The sand dunes rise to as much as 750 feet above the valley floor.

The climate is cold and dry. The average annual temperature at Saguache is 43 degrees F, and the average annual precipitation is 8.6 inches. The average growing season is about 119 days at Saguache and about 95 days at Center.

The Saguache County Area is mainly ranches and farms. The principal enterprises are raising cattle and sheep and raising irrigated crops. Potatoes, barley, wheat, lettuce, and alfalfa are the main crops.

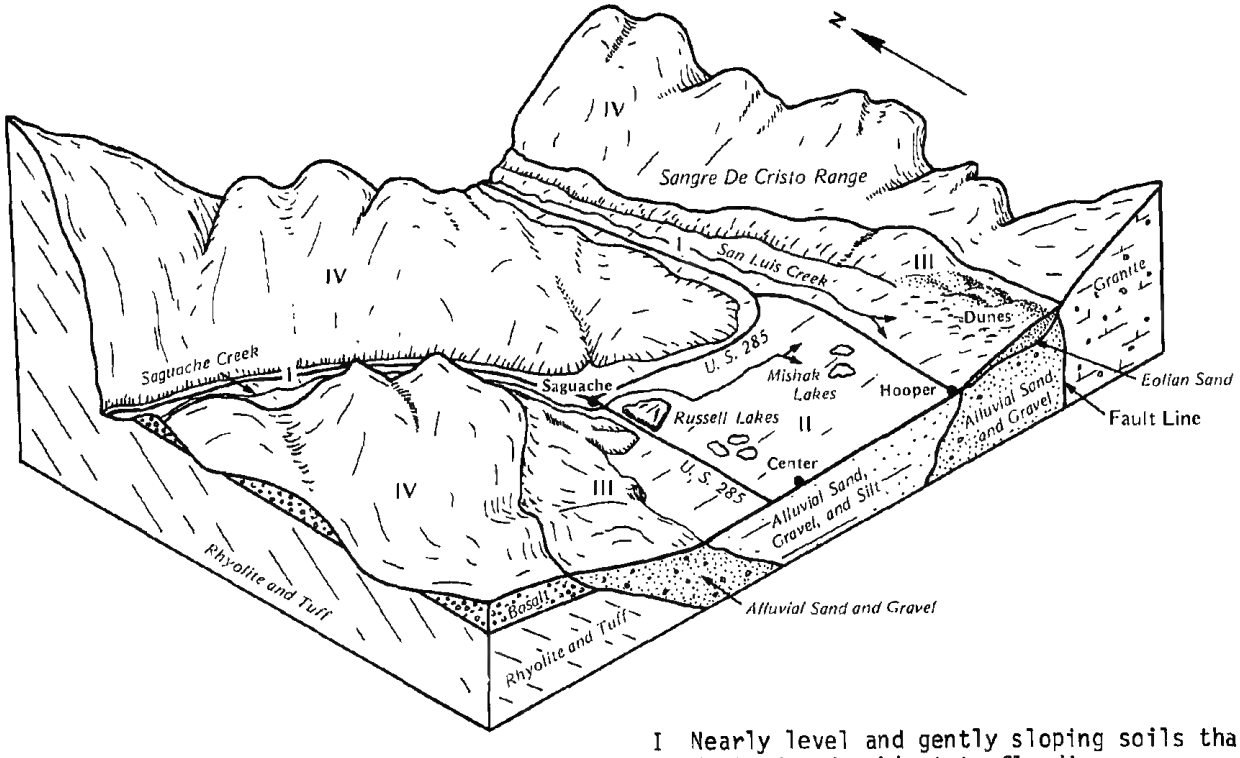
General Nature of the Survey Area

This section gives general information concerning the area. It discusses history and development, natural resources, farming, and climate.

History and Development

The name "Saguache" was taken from an Indian phrase meaning "Land of Blue Water" (*5*). The area was originally Spanish territory for many years, and later became a part of Mexico and subsequently a part of the United States during the Mexican War. The county was first settled shortly after the Civil War by prospectors, miners, and homesteaders. Then, heirs of Don Luis Maria Cabeza de Vaca were given 99,000 acres in the county in exchange for a part of the huge land grant of 1821 in New Mexico. In the 1880's when George Adams imported Hereford cattle from England, one of the largest Hereford ranches in the state was established on the Baca Grant (*5*).

In the 1880's, when many prospectors and miners came to Saguache County seeking gold and silver, several towns with mills and smelters were constructed in the Kerber Creek area. Lead and silver were mined throughout the early part of the twentieth century. Many gold mines were discovered along the western slope of the Sangre de Cristo Range during this period. "Boom towns" such as Crestone, Duncan, and Liberty were quickly established, but most of these towns were on the Baca Grant and were abandoned.



I Nearly level and gently sloping soils that are poorly drained and subject to flooding
II Nearly level and gently sloping soils that are poorly drained to well drained and affected by salt and alkali
III Nearly level to steep soils that are moderately well drained to excessively drained
IV Gently sloping to very steep, well drained soils, and Rock outcrop

Figure 1.—Pattern of broad groups of soils on the general soil map.

Also in the 1880's, T. C. Henry excavated the large Rio Grande Canal to be used for irrigating more than 200,000 acres (*8*). At the same time, potatoes were first grown commercially in Saguache County. Irrigation enabled farming to spread farther from streams into the center of the valley. Field peas, potatoes, and wheat and other small grains were grown on the irrigated land. But, irrigation also brought problems. Salts and other minerals accumulated in the irrigated soils, causing some farmers to abandon their fields, which soon grew back to brush.

The ranching, farming, and mining encouraged the Denver and Rio Grande Western Railroad to extend across Saguache County, and towns such as Hooper, Moffat, and Villa Grove were established along the railroad. By the 1940's, abandonment of mines and farms caused the decline of the railroad.

Saguache, the county seat, is at an elevation of 7,697 feet, and in 1970, had a population of 613 (*10*). The population of the county reached a peak in the early 1900's and has steadily declined since that time. Agriculture is the main source of income for the county. Tourism, mining, and timber production account for a small part.

Natural Resources

Soil and water are the most important natural resources of the county. Sheep and cattle, crops produced on irrigated farms, and timber are marketable products derived from the soil.

Water used for irrigation is obtained from the Rio Grande River, Saguache Creek, and small streams and from irrigation wells varying in depth and the amount of water they yield (*25*). Some of the irrigation wells and many stockwater and domestic wells are flowing artesian wells (*11*). The water resource is vital to the agriculture of the area.

Gold and silver are the principal minerals removed from the few small mines operating in the county. Many of the soils on the valley floor are underlain by sand and gravel deposits, which are extracted from many small pits and are primarily used for roadbuilding material.

Farming

Ranching and irrigated farming are the principal sources of income in the survey area. The extensive rangeland is primarily used for grazing cattle. Many of the irrigated farms are used for raising winter feed for cattle and sheep. Livestock graze on high mountain rangeland during the summer, mostly on public land administered by the Bureau of Land Management and the Forest Service. Many irrigated hay meadows adjacent to streams are used for pasture in fall and early in spring. There are about 43 ranches in the county, mostly over 640 acres. In 1979, there were about 23,000 cattle and about 11,000 sheep in the county (*9*).

Irrigated crops are grown on about 164 farms; and the average sized farm is about 460 acres (*28*). Of the cropland in the area, about 36,000 acres is used for alfalfa and other hay crops; 24,000 acres for barley; 7,000 acres for potatoes; 2,500 acres for oats; 8,800 acres for spring wheat; and 2,000 acres for lettuce.

Saguache County Area produces one-third to one-half of the lettuce grown in Colorado. Much of the barley is sold to breweries for malting. Spring wheat is becoming more important as new varieties of white wheat are developed and marketed for use in making crackers and pastries.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

In Saguache County Area, summers are warm or hot in most valleys and much cooler in the mountains. Winters are cold in the mountains. Valleys are colder than the lower slopes of adjacent mountains because of cold air drainage. Precipitation occurs in the mountains throughout the year, and a deep snowpack accumulates during winter. Snowmelt usually supplies much more water than can be used for agriculture in the area. Precipitation in valleys in summer falls as showers, and some thunderstorms occur. In winter, the ground is covered with snow much of the time. Chinook winds, which blow downslope and are warm and dry, often melt and evaporate the snow.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Saguache in the period 1951 to 1978. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 22 degrees F, and the average daily minimum temperature is 7 degrees. The lowest temperature on record, which occurred at Saguache on January 7, 1971, is -34 degrees. In summer the average temperature is 62 degrees, and the average daily maximum temperature is 80 degrees. The highest recorded temperature, which occurred on June 23, 1954, is 93 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 8.64 inches. Of this, 6 inches, or 70 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 5 inches. The heaviest 1-day rainfall during the period of record was 1.50 inches at Saguache on June 17, 1969. Thunderstorms occur on about 60 days each year, and most occur in summer.

The average seasonal snowfall is 29 inches. The greatest snow depth at any one time during the period of record was 14 inches. On an average of 21 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 40 percent. Humidity is higher at night, and the average at dawn is about 60 percent. The sun shines 80 percent of the time possible in summer and 60 percent in winter. The prevailing wind is from the southeast. Average windspeed is highest, 11 miles per hour, in spring.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their

position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests (*3, 15*). Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed, and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soils on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas (*18*).

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The map units are rated for *cultivated crops, woodland, urban uses,* and *recreation areas*. Cultivated crops are those grown extensively in the survey area. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments. Intensive recreation areas are campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic. Extensive recreation areas are those used for nature study and as wilderness.

Soil Descriptions

Nearly level and gently sloping soils that are poorly drained and subject to flooding

This group consists of one map unit. It makes up about 7 percent of the survey area. The soils in this group are nearly level and gently sloping. The native vegetation is mainly water-tolerant grasses, forbs, and woody shrubs. The average annual precipitation is about 7 to 10 inches; the average annual air temperature is 41 degrees F; and the average frost-free season is 90 to 95 days.

The soils in this group are deep and poorly drained. They formed in alluvium.

In most areas these soils are used for irrigated pasture. In a few areas they are used for alfalfa and native grass hay.

1. Big Blue-Gerrard

Deep, nearly level and gently sloping, poorly drained loamy soils; on flood plains, low terraces, and fans

This map unit consists of deep, nearly level and gently sloping soils on flood plains, low terraces, and fans adjacent to streams. These soils have a seasonal high water table during spring and summer and are commonly flooded for short periods in spring. Slopes range from 0 to 3 percent.

This map unit makes up about 7 percent of the survey area. It is about 45 percent Big Blue soils and 35 percent Gerrard soils and similar soils. The rest is minor soils.

Big Blue and similar soils are on flood plains and terraces. They have a clay loam surface layer. The underlying material is clay loam and gravelly sandy clay loam.

Gerrard soils and similar soils are on flood plains, low lying terraces, and fans. They are 12 to 20 inches deep over sand and gravel. These soils have a loam surface layer and a thin subsoil of gravelly sandy clay loam. The substratum is gravelly loamy sand.

Of minor extent in this map unit are the well drained Jodero soils on alluvial fans and stream terraces.

About 10 percent of this map unit has been drained and is used for alfalfa. In most areas the soils are used for irrigated pasture, and in some areas they are used for native grass hay.

The soils are suited to raising beef cattle, which is the main enterprise. The flood hazard in spring, poor drainage, and short supply of irrigation water late in summer are the main limitations.

The soils in this map unit are poorly suited to homesite development, road development, and sanitary facilities. The flood hazard, poor drainage, and frost action are the main limitations to those uses.

The vegetation on this unit is mainly water-tolerant grasses, forbs, and woody shrubs.

Nearly level and gently sloping soils that are poorly drained to well drained and affected by salt and alkali

This group consists of three map units. It makes up about 31 percent of the survey area. The soils in this group are nearly level and gently sloping. The native vegetation is mainly salt- and alkali-tolerant shrubs and

grasses. The average annual precipitation is about 7 to 8 inches; the average annual air temperature is 41 degrees F; and the average frost-free season is 95 days.

The soils in this group are deep and poorly drained to well drained. They formed in alluvium.

In most areas these soils are used as range. In a few areas they are used for irrigated alfalfa, small grains, and potatoes.

2. Hooper-Hagga-Hapney

Deep, nearly level, poorly drained and moderately well drained loamy soils; on flood plains, terraces, and fans

This map unit consists of deep, nearly level soils on flood plains, terraces, and fans on the valley floor. Elevation is generally uniform except in places broken by small intermittent streams and dry lake basins that are slightly lower. The soils of this unit have a seasonal high water table in most places during spring and summer and are affected by salt and alkali. Slopes range from 0 to 1 percent.

This map unit makes up about 16 percent of the survey area. It is about 50 percent Hooper soils, 20 percent Hagga soils, and 15 percent Hapney soils. The rest is minor soils.

Hooper soils are on flood plains, low terraces, and alluvial fans. They are moderately well drained and have a clay loam surface layer. The subsoil is clay, and the substratum, at a depth of 20 to 40 inches, is very gravelly sand. These soils are very strongly affected by alkali. In some areas the surface layer is loamy sand.

Hagga soils are poorly drained soils on low terraces adjacent to small intermittent streams. They have a loam surface layer and stratified clay loam to sandy loam substratum. They are affected by salt and alkali.

Hapney soils are on flood plains and fans. They are moderately well drained. These soils have a clay loam surface layer and have a clay loam and clay subsoil and substratum. They are strongly affected by alkali.

Of minor extent in this map unit are the moderately well drained and somewhat poorly drained San Luis and Arena soils on flood plains and fans and the moderately well drained Corlett soils and well drained Laney soils on slightly higher positions.

The soils in this map unit are used mainly for range and are grazed by beef cattle. High salt and alkali accumulations cause plant cover to be very sparse, except in the wetter areas, where salt-tolerant grasses grow. Many large areas have mainly shrubs that are not grazed by livestock; large spots of bare soil are between the shrubs.

The soils in this unit are poorly suited to crops. They require heavy applications of soil amendments, such as gypsum or sulfuric acid, to help neutralize the alkali. The soils are poorly suited to homesite and road development. The main limitations are the high shrink-swell potential, alkali and salt, seasonal high water table, and moderately slow to very slow permeability.

The vegetation on this unit is mainly alkali-tolerant shrubs. In small areas where extra moisture is available, it is salt- and alkali-tolerant grasses.

3. San Luis-Laney

Deep, nearly level and gently sloping, somewhat poorly drained to well drained loamy soils; on fans and flood plains

This map unit consists of deep, nearly level and gently sloping soils on fans and flood plains. These soils are affected by salt and alkali. San Luis soils have a seasonal high water table. Slopes range from 0 to 3 percent.

This map unit makes up about 12 percent of the survey area. It is about 55 percent San Luis soils and 30 percent Laney soils. The rest is minor soils.

San Luis soils are on fans and flood plains. They are moderately well drained and somewhat poorly drained. They have a sandy loam surface layer, a clay loam and sandy clay loam subsoil, and a very gravelly sand substratum, which is at a depth of 20 to 40 inches. They are strongly affected by salt and alkali, except where they have been drained and leached.

The well drained Laney soils are on flood plains and fans. They have a loam surface layer and underlying material of stratified loam, clay loam, and loamy coarse sand. They are strongly affected by alkali.

Of minor extent in this map unit are the moderately well drained Hapney soils, in slight depressions, and the poorly drained Vastine soils, on flood plains and terraces adjacent to small streams.

About 30 percent of the acreage of this unit has been drained and leached and is used for irrigated small grains and alfalfa. Most of the acreage is used as range and is grazed by beef cattle.

The soils of this unit need applications of gypsum or sulfuric acid to help lower the salt and alkali content in the root zone of plants before irrigated crops can be successfully grown. Low available water capacity and salt and alkali accumulations cause plant cover to be sparse, and range productivity is typically low. The soils have low potential for homesite and road development. The main limitations are the seasonal high water table in the San Luis soils, the strong salt and alkali accumulations, and the hazard of frost action.

The vegetation on this unit is mainly salt- and alkali-tolerant grasses and shrubs.

4. Gunbarrel-Mosca-Kerber

Deep, nearly level, poorly drained to well drained sandy soils; on flood plains, terraces, and fans

This map unit consists of deep, nearly level soils on flood plains, terraces, and fans. These soils are affected by a seasonal water table within 2 feet of the surface during spring and summer and by salt and alkali

accumulations, except where drained and leached. Slopes range from 0 to 1 percent.

This map unit makes up about 3 percent of the survey area. It is about 50 percent Gunbarrel soils, 20 percent Mosca soils, and 15 percent Kerber soils. The rest is minor soils.

Gunbarrel soils are on terraces and fans. These somewhat poorly drained soils have a loamy sand surface layer and loamy sand and coarse sand underlying material. They are strongly affected by salt and alkali accumulations, except where they have been drained and leached.

Mosca soils are on fans and flood plains. These well drained soils have a loamy sand surface layer. The subsoil is sandy loam, and the substratum is loamy sand over gravel and sand. These soils are moderately affected by alkali.

Kerber soils are on fans and flood plains. These somewhat poorly drained soils have a loamy sand surface layer. The subsoil is sandy loam, and the substratum is loamy sand over gravel and sand. These soils are affected by salt and alkali.

Of minor extent in this map unit are somewhat poorly drained San Luis, San Arcacio, and McGinty soils, all of which are nearly level.

About 30 percent of the acreage of this unit has been drained and is used for irrigated small grains, alfalfa, and potatoes. Most of the acreage is used as range and is grazed by beef cattle and sheep.

The soils of this unit need to be drained before irrigated crops can be successfully grown, and in some places gypsum or sulfuric acid is needed to help lower the content of salts and alkali in the root zone. Low available water capacity and salt and alkali accumulations cause plant cover to be sparse, and range productivity is typically low. The major limitations for homesite and road development are the seasonal high water table, strong salt and alkali accumulations, and frost action hazard.

The vegetation on this unit is mainly salt- and alkali-tolerant grasses and shrubs.

Nearly level to steep soils that are moderately well drained to excessively drained

This group consists of five map units. It makes up about 33 percent of the survey area. The soils in this group are nearly level to moderately sloping. The native vegetation is mainly short grasses, shrubs, and forbs. The average annual precipitation is about 7 to 10 inches; the average annual air temperature is 41 degrees F; and the average frost-free season is 95 days.

The soils in this group are deep and well drained to excessively drained. They formed in alluvium and eolian sand.

In most areas these soils are used as range and for irrigated small grains, potatoes, and alfalfa. In a few areas they are used for homesites and recreation.

5. Saguache-San Arcacio-Dunul

Deep, nearly level and gently sloping, well drained gravelly and loamy soils; on flood plains, fans, and terraces

This map unit consists of deep, nearly level and gently sloping soils on fans, terraces, and old flood plains. These soils contain a large amount of gravel and are droughty. Slopes range from 0 to 3 percent.

This map unit makes up about 1 percent of the survey area. It is about 40 percent Saguache soils, 30 percent San Arcacio soils, and 20 percent Dunul soils.

Saguache soils are on flood plains and low terraces. They have a gravelly sandy loam surface layer. The underlying material is gravelly loamy sand over very gravelly sand.

San Arcacio soils are on low terraces. They have a sandy loam surface layer and a sandy clay loam subsoil. The substratum is sandy loam over sand and gravel.

Dunul soils are on fans and terraces. They have a very gravelly sandy loam surface layer. The underlying material is very gravelly sand that is calcareous in the upper part.

Of minor extent are the moderately well drained sandy Norte soils, well drained Mosca soils, and somewhat poorly drained San Luis and Gunbarrel soils.

Most of the acreage of these soils is used for irrigated crops, including barley, potatoes, alfalfa, and head lettuce. Some is used as range and is grazed by cattle and sheep.

The border method of irrigation, which entails land leveling and short lengths of run, or the sprinkler method is needed to help prevent seepage and water loss. Applications of commercial fertilizer and manure are needed to maintain good yields of crops. Low rainfall and low available water capacity cause plant cover to be sparse, and range productivity is typically low. The soils are suited to homesite and road development, although the seasonal high water table and frost action can be limiting factors on the minor soils.

The native vegetation on this unit is mainly short grasses and shrubs.

6. Norte-Dunul-Graypoint

Deep, nearly level and gently sloping, moderately well drained to somewhat excessively drained gravelly and loamy soils; on terraces and fans

This map unit consists of deep, nearly level and gently sloping soils on terraces and fans. These soils are gravelly and droughty. Slopes range from 0 to 3 percent.

This map unit makes up about 1 percent of the survey area. It is about 50 percent Norte soils, 20 percent Dunul soils, and 20 percent Graypoint soils. The rest is minor soils.

Norte soils are moderately well drained, and they are on terraces and fans. The surface layer is gravelly sandy

loam, and the underlying material is gravelly sandy loam over very gravelly sand.

Dunul soils are somewhat excessively drained, and they are on terraces and fans. The surface layer is very gravelly sandy loam, and the underlying material is very gravelly sand.

The well drained Graypoint soils are on fans and terraces. They have a surface layer of gravelly sandy loam and a subsoil of sandy clay loam and gravelly sandy clay loam. The substratum is very gravelly sandy loam over sand.

Of minor extent in this map unit are the well drained Saguache and Platoro soils.

Most of the acreage of this map unit is used for irrigated crops of barley, potatoes, and alfalfa. Some is used as range and is grazed by cattle and sheep.

The border method of irrigation, which entails land leveling and short lengths of run, or the sprinkler method is needed to help prevent seepage and water loss. Applications of commercial fertilizer and manure are needed to maintain good yields of most crops. Low rainfall and low available water capacity cause plant cover to be sparse, and range productivity is typically low. The soils are suited to homesite and road development.

The native vegetation on this unit is drought-tolerant short grasses and shrubs.

7. Garita-Platoro-Luhon

Deep, nearly level to moderately sloping, well drained gravelly and loamy soils; on fans, foot slopes, and valley side slopes

This map unit consists of deep, nearly level to moderately sloping soils on fans on the outer edge of the valley floor. Slopes range from 0 to 9 percent.

This map unit makes up about 15 percent of the survey area. It is about 35 percent Garita soils, 30 percent Platoro soils, and 20 percent Luhon soils. The rest is minor soils.

Garita soils are on fans and foot slopes. They have a gravelly loam surface layer and calcareous very gravelly loam underlying material.

Platoro soils are on broad fans and terraces. They have a loam surface layer and a subsoil of clay loam and gravelly clay loam. The substratum is very gravelly loam over very gravelly loamy sand.

Luhon soils are on fans and valley side slopes. They have a loam surface layer and underlying material of calcareous loam over sandy loam.

Of minor extent in this map unit are the well drained gravelly Graypoint soils and Monte soils on fans and terraces and the well drained Rock River and Travelers soils on ridges and valley side slopes.

The soils in this map unit are used mainly as range and are grazed by beef cattle and sheep. Low rainfall causes plant cover to be somewhat sparse, affecting range productivity. A few areas are used for irrigated crops of barley and alfalfa. Land leveling or use of sprinklers is needed to obtain uniform application of irrigation water and help control runoff. These soils are suited to homesite and road development.

The native vegetation on this unit consists of short grasses and shrubs.

8. Space City-Cotopaxi

Deep, nearly level to moderately sloping, somewhat excessively drained sandy soils; on valley floors

This map unit consists of deep, nearly level to moderately sloping soils on valley floors. Elevation is generally uniform except in places broken by small intermittent streams and low wind-deposited hills and ridges. Slopes range from 0 to 15 percent.

This map unit makes up about 12 percent of the survey area. It is about 45 percent Space City soils and about 40 percent Cotopaxi soils. The rest is minor soils.

Space City soils are on low dunelike topography on valley floors. They have a loamy sand surface layer, and the underlying material is calcareous loamy sand.

Cotopaxi soils are on dunelike hills and ridges along the edge of the valley floor. They have a sand surface layer and sand underlying material.

Of minor extent in this map unit are the well drained to somewhat excessively drained Mount Home soils, the moderately well drained, alkali-affected Corlett soils, and the moderately well drained Hooper soils in depressions.

These soils are used as range and are grazed by beef cattle. Plant cover is somewhat sparse, affecting range productivity and the hazard of soil blowing. The soils are suited to homesite and road development if caving hazard, sandy texture, rapid permeability, and the hazard of soil blowing are taken into account.

The native vegetation on this unit consists of perennial grasses, woody shrubs, and forbs.

9. Dune land

Deep, gently rolling to steep, excessively drained sandy soils; on dunes

This map unit consists of deep, gently rolling to steep soils on dunes. Dune land is made up of shifting, wind-reworked sands as much as 600 feet higher than the surrounding landscape (fig. 2).

This map unit makes up about 4 percent of the survey area. It is about 80 percent active sand dunes. The rest is minor soils.

Of minor extent, near the outer edge of dunes, are sandy Cotopaxi soils and cobbly Mount Home soils. Minor soils that have vegetation consisting of perennial grasses, forbs, and shrubs are Space City soils. Pinyon and juniper trees are common adjacent to the western boundary of the survey area.

This unit is mainly within the Great Sand Dunes

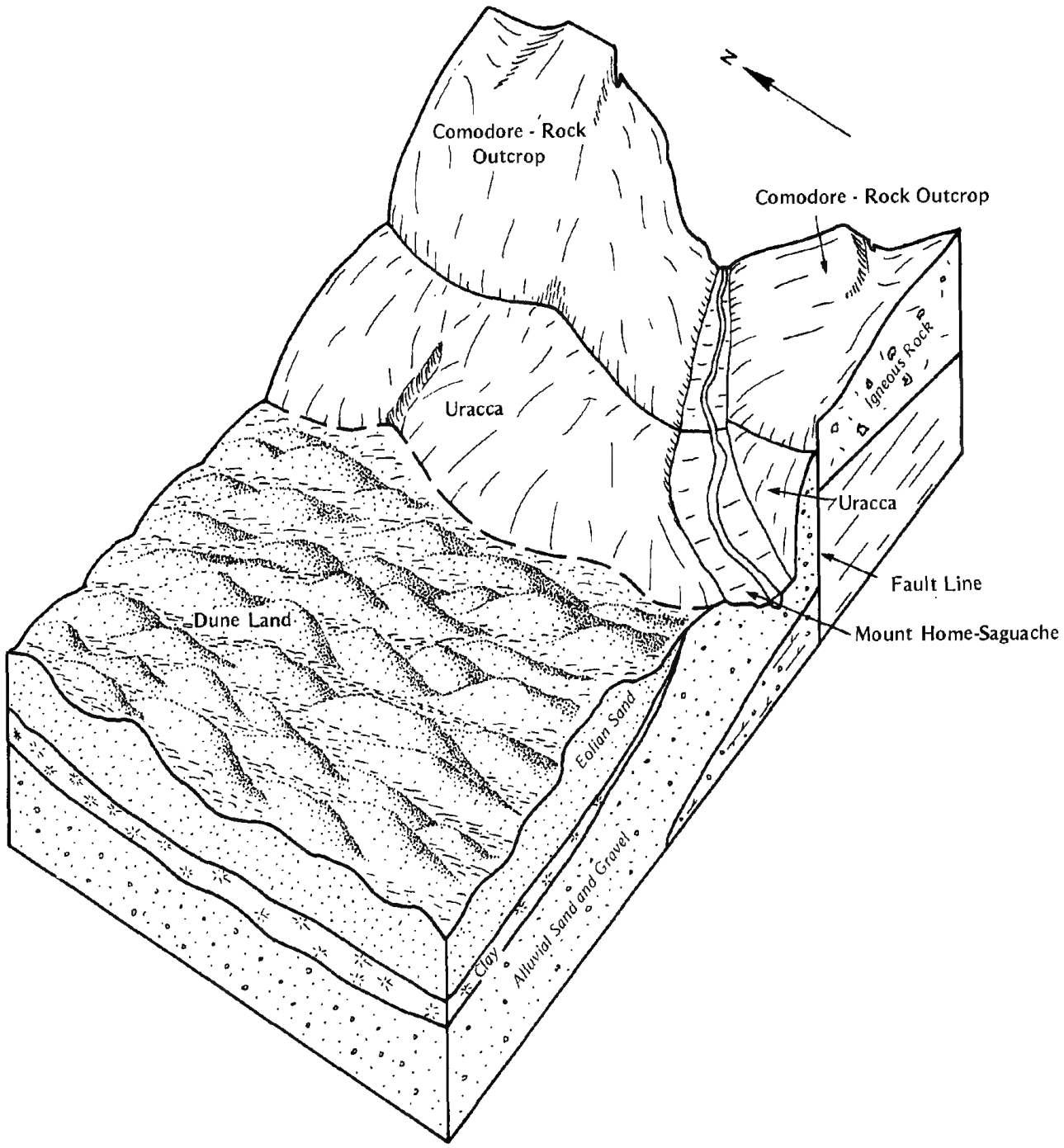


Figure 2.—Pattern of soils in the Dune land map unit and soils in the Comodore-Uracca-Rock outcrop map unit.

National Monument and is used mostly for recreation.

Gently sloping to very steep, well drained soils, and Rock outcrop

This group consists of five map units. It makes up about 29 percent of the survey area. The soils in this group are nearly level to very steep. The native vegetation is mainly grasses, shrubs, forbs, and conifers. The average annual precipitation is about 7 to 20 inches; the average annual air temperature is 34 to 43 degrees

F; and the average frost-free season is 30 to 95 days.

The soils in this group are deep to shallow and well drained. They formed in colluvium and alluvium derived dominantly from igneous rock.

The soils in this group are used mainly for wildlife habitat and recreation. They are also used as range and woodland.

10. Travelers-Garita-Rock outcrop

Deep and shallow, gently sloping to steep, well drained and somewhat excessively drained, stony and gravelly loamy soils, and Rock outcrop; on hills, ridges, mesas, fans, and foot slopes

This map unit consists of Rock outcrop and shallow and deep, gently sloping to steep soils on fans, ridges, hills, mesas, and foot slopes that are broken by deeply incised, small intermittent streams. Slopes range from 3 to 35 percent.

This map unit makes up about 7 percent of the survey area. It is about 45 percent Travelers soils, 25 percent Garita soils, and 15 percent Rock outcrop. The rest is minor soils.

Travelers soils are on hills, ridges, and basalt-capped mesas. They are shallow over basalt. They have a very stony loam surface layer and a subsoil of calcareous very stony loam.

Garita soils are on fans and foot slopes. These deep soils have a gravelly loam surface layer and underlying material of calcareous very gravelly loam.

Rock outcrop consists of areas of exposed basalt.

Of minor extent in this map unit are Monte soils, on narrow fans and flood plains, and Luhon and Rock River soils, on fans and valley side slopes.

The soils in this unit are used as range and are grazed by beef cattle and sheep. Wildlife habitat and recreation are important uses also. Low rainfall and the steepness, shallowness, and stoniness of the soils are the main limitations. Homesite and road development and sanitary facilities are also affected by these limitations.

The vegetation on this unit is mainly short grasses and shrubs.

11. Comodore-Uracca-Rock outcrop

Deep and shallow, strongly sloping to very steep, well drained, very stony and very cobbly loamy soils, and Rock outcrop; on mountainsides and fans

This map unit consists of shallow and deep, strongly sloping to very steep soils on mountainsides and fans. The slopes are complex and are broken by many deeply incised, small streams. Slopes range from 15 to 65 percent.

This map unit makes up about 8 percent of the survey area. It is about 40 percent Comodore soils, 30 percent Uracca soils, and about 20 percent Rock outcrop. The rest is minor soils.

Comodore soils are steep and very steep soils on mountainsides. They are shallow over bedrock. They have a very stony loam surface layer that is underlain by very stony material above the bedrock.

Uracca soils are deep, strongly sloping to steep soils on fans and mountainsides. They have a very cobbly loam surface layer and a subsoil of very cobbly clay loam over extremely cobbly sandy clay loam. The substratum is extremely cobbly loam over extremely cobbly sandy loam.

Rock outcrop consists of areas of exposed granite.

Of minor extent in this map unit are very cobbly Mount Home soils, gravelly Saguache soils, and sandy Cotopaxi, Ouray, and Sabe soils.

The soils in this unit are used mainly for recreation and as wildlife habitat. A few areas have been mined for gold, silver, iron, and other minerals. Summer homesites are an important use also. The steepness and shallowness of these soils and the stones, cobblestones, and rock outcrops are the main limitations to those uses.

The vegetation on this unit is mainly pinyon pine and juniper trees. In some areas it is perennial grasses, forbs, and shrubs. North-facing slopes commonly have Douglas-fir and Engelmann spruce timber.

12. Seitz-Bushvalley-Rock outcrop

Deep and shallow, rolling to very steep, well drained, very stony and cobbly loamy soils, and Rock outcrop; on mountainsides and ridges

This map unit consists of shallow and deep, rolling to very steep soils on mountainsides and ridges. The slopes are complex and are broken by many small streams. Slopes range from 9 to 65 percent.

This map unit makes up about 5 percent of the survey area. It is about 50 percent Seitz soils, 25 percent Bushvalley soils, and 10 percent Rock outcrop. The rest is minor soils.

Seitz soils are deep, steep to very steep, timbered soils that generally are on north-facing mountainsides. They have a thin layer of forest litter over a very stony loam surface layer. The subsoil is very stony clay loam over very stony clay. The substratum is extremely stony clay loam.

The rolling to very steep Bushvalley soils are on ridges and mountainsides. They are shallow over rhyolite and andesite bedrock. They have a cobbly loam surface layer. The subsoil is extremely cobbly clay loam overlying the bedrock.

Rock outcrop consists of areas of exposed rhyolite and andesite rock.

Of minor extent in this map unit are deep, gently sloping to moderately sloping loamy Decross and Morval soils, in open parks, and Jodero and Lolo soils, adjacent to streams on fans and terraces.

The soils in this unit are used for range, woodland, wildlife habitat, and recreation.

The Seitz soils are suited to timber production. The main limitations affecting timber harvesting are large stones and steep slopes. Bushvalley soils are suited to summer grazing by cattle and sheep. Deer and elk also graze on these soils. The soils in this unit are not well suited to homesite and road development or to sanitary facilities. The main limitations are the steepness, shallowness, and stoniness of the soils and the rock outcrops.

The vegetation on this unit consists of Engelmann spruce and subalpine fir on the Seitz soils above 10,000 feet. Below this elevation Douglas-fir and ponderosa pine are the main trees. Mountain grasses and shrubs are the main plant species on the Bushvalley soils.

13. Hopkins-Cheadle-Parlin

Deep and shallow, gently sloping to steep, well drained, channery and gravelly loamy soils; on ridges and mountainsides

This map unit consists of shallow and deep, gently sloping to steep soils on mountainsides and ridges. The slopes are complex and are broken by many small streams. Slopes range from 3 to 35 percent.

This map unit makes up about 7 percent of the survey area. It is about 30 percent Hopkins soils, 25 percent Cheadle soils, and about 20 percent Parlin soils. The rest is Rock outcrop and minor soils.

Hopkins soils are deep and well drained. They are on ridges and mountainsides. They have a channery loam surface layer and channery loam underlying material over flagstone.

Cheadle soils are on ridges and mountainsides. They are shallow over bedrock. The surface layer is channery loam. The underlying material above the bedrock is very channery loam.

Parlin soils are on ridges and mountainsides. These deep soils have a gravelly loam surface layer. The substratum is gravelly clay loam over extremely gravelly clay loam and extremely stony clay loam.

Of minor extent in this map unit are Decross and Morval soils on valley side slopes and fans and terraces adjacent to small intermittent streams; Leaps soils on fans and valley side slopes; and Gelkie soils on toe slopes and mountainsides.

The soils in this unit are used mainly as range and are grazed by cattle and sheep. Wildlife habitat and recreation are important uses also.

The limited rainfall and sparse plant cover affect range productivity on these soils. The soils are not well suited to homesite and road development or to sanitary facilities. The main limitations are the steepness and shallowness of the soils, the pebbles and flagstones, and the rock outcrops.

The native vegetation on this unit consists of perennial grasses and shrubs and a few pine trees in some places.

14. Bushvalley-Gelkie-Tellura

Deep and shallow, gently sloping to very steep, well drained cobbly and loamy soils; on ridges and mountainsides

This map unit consists of shallow and deep, gently sloping to very steep soils on mountain ridges, side slopes, and fans. The slopes are complex and are broken by many small streams. Slopes range from 3 to 65 percent.

This map unit makes up about 2 percent of the survey area. It is about 40 percent Bushvalley soils, 30 percent Gelkie soils, and 20 percent Tellura soils. The rest is Rock outcrop and minor soils.

The rolling to steep Bushvalley soils are on ridges and mountainsides. They are shallow over rhyolite and andesite bedrock. They have a cobbly loam surface layer. The subsoil is extremely cobbly clay loam and overlies the bedrock.

The gently sloping to steep Gelkie soils are on mountainsides. They are deep and have a loam surface layer. The subsoil is gravelly clay loam. The substratum is calcareous gravelly loam over very gravelly loam.

The rolling to steep Tellura soils are on ridges and mountainsides. They have a very cobbly loam surface layer. The subsoil is very cobbly clay loam. The substratum is extremely cobbly clay loam and is underlain by hard bedrock.

Of minor extent in this map unit are shallow Tolman soils on lower foothill side slopes and Jodero and Lolo soils on alluvial fans and terraces adjacent to streams.

The soils in this unit are used as range and for wildlife and recreation. Several small abandoned mines are on this unit, where gold, silver, and other minerals were mined in past years.

These soils are suited to summer grazing by cattle and sheep. Deer and elk also graze this unit. These soils are not well suited to homesite and road development or to sanitary facilities. The main limitations are the shallowness and steepness of the soils, the cobblestones, and the rock outcrops.

The vegetation on this unit consists of mountain grasses and shrubs. A few south- and east-facing slopes have pinyon pine and juniper trees.

Broad Land Use Considerations

The soils in the Saguache County Area vary widely in their potential for major land uses. Approximately 8.5 percent of the land area is used for cultivated crops, mainly alfalfa, barley, and potatoes. This cropland is mainly in the south-central part of the survey area. It is dominantly in map units 3, 4, 5, and 6; some is in map unit 7. Soils in map units 3 and 4 are strongly affected by salts and alkali, except where they have been drained and leached. Most of these soils often have a seasonal high water table that causes salts to accumulate in the

Figure 3.—San Arcacio sandy loam is suited to furrow irrigation of head lettuce.

surface layer and adversely affects most crops. The major soils in map units 3 and 4 are San Luis, Gunbarrel, and Mosca soils. The soils in map units 5, 6, and 7 are moderately well drained to somewhat excessively drained soils that are droughty and subject to blowing if crop residue is removed. San Arcacio (fig. 3), Norte, and Platoro soils are the main soils in map units 5, 6, and 7 that are used for cultivated crops.

About 7 percent of the acreage is poorly drained and is subject to flooding. It is used mainly for irrigated pasture and hayland. The soils in map unit 1 and parts of 2 have high potential for salt- and water-tolerant grasses and legumes. In these units the major soils are Big Blue and Gerrard soils on flood plains and low terraces and Hagga soils on terraces.

About 57 percent of the acreage is used as range. The productivity of grasses and forbs is low on map units 2, 8, and 10 because of the low rainfall and alkali-affected soils; and it is moderately low on map units 7, 11, 13, and 14 because of droughty soils and low rainfall. Almost half the rangeland is public land administered by the Bureau of Land Management, and about one-fifth is state land.

About 27,000 acres is within the Great Sand Dunes National Monument. Most of this acreage is in map unit 9 and is used for recreation and as wildlife habitat.

Only about 1 percent of the acreage is in woodland. Commodore and Uracca soils, in map unit 11, have good potential for pinyon pine. Seitz and Bushvalley soils, in map units 12 and 14, have good potential for ponderosa pine and Douglas-fir on the drier parts and Engelmann spruce on the wetter parts.

About 1 percent of the survey area is subdivided for homesites or is in municipal uses. Generally, the soils in map units 5, 7, and 8 have good potential for urban uses. In map units 1, 2, and 3, Big Blue, Gerrard, Hagga, and Jodero soils have a potential flood hazard. Also, Gunbarrel and San Luis soils have a high water table,

are affected by salts, and are subject to frost action, which limits the potential for homesites and roads. In map units 10, 11, 12, 13, and 14, the steepness of slopes, the shallowness of soils, such as Travelers, Bushvalley, Comodore, and Cheadle soils, and the areas of Rock outcrop are limitations for homesites and sanitary facilities.

The potential for recreation use ranges from low to high, depending on the type and intensity of expected use, the variability of the topography and climate, and the soil properties. Most of the soils in map units 7 and 8 have high potential for recreation development. The soils in map unit 1 have low potential because of flooding. The steep slopes and stones in map units 10, 11, 12, 13, and 14 limit the soils for intensive recreation uses, such as playgrounds and camp areas. In all these units, however, the soils are suitable for recreation uses, such as hiking or horseback riding. Small areas of soils suitable for intensive development may be available in map units where the overall potential for recreation development is low.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Hooper loamy sand is one of several phases in the Hooper series.

Some map units are made up of two or more major soils. These map units are called soil complexes, or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Jodero-Lolo wet complex, 0 to 6 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Cryaquolls and Histosols, nearly level, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop, steep, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

1—Acasco clay loam. This deep, nearly level, poorly drained soil is on terraces and fans on alluvial valley floors. Elevation is 7,600 to 7,900 feet. The soil formed in alluvium derived principally from basalt. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 95 days.

Included in this unit are small areas of San Luis sandy loam and Torsido loam.

Typically, the surface layer of this Acasco soil is gray clay loam about 9 inches thick that contains yellowish red mottles. The subsoil is grayish brown heavy clay loam about 15 inches thick that contains yellowish brown mottles. The substratum to a depth of 60 inches is gravelly sand.

Permeability is slow. Effective rooting depth is limited by a high water table that fluctuates between depths of 1.5 and 2.0 feet. Available water capacity is moderate. Runoff is slow, and the hazard of erosion is slight. In some years, flooding occurs during spring runoff.

This soil is used for range, irrigated pasture, and hayland and for irrigated crops in some small areas

where drainage has been established. Protection from flooding, drainage, and land leveling are necessary if crops are grown on this soil. Alfalfa, grasses, and small grains are suitable crops if this soil is drained. Water-tolerant plants are most suitable for pasture seeding on this soil. The border method of irrigation is generally best suited to all crops grown.

The potential natural vegetation on this soil is dominated by slender and western wheatgrasses on the drier parts and by tufted hairgrass, bluejoint reedgrass, and Nebraska sedge on the wettest part. If the range deteriorates, the proportion of more desirable plants decreases, and that of the less desirable plants, such as foxtail barley, Baltic rush, forbs, and woody shrubs, increases. Undesirable weeds and annuals invade and become more abundant as the range condition declines.

Seeding rangeland on this soil is difficult because of soil wetness and the high cost of seedbed preparation. Renovating, deferred grazing, rotational grazing, cross fencing, and brush control are needed to prevent range deterioration and to promote the growth and increase of more desirable plant species.

The Acasco soil is generally suited to windbreaks and environmental plantings. Poor drainage and abundant, persistent vegetation are the main limitations to establishing trees and shrubs. Rodent damage is also a threat to seedlings. Continued cultivation for weed control and proper plant selection are needed to insure survival of plantings. Trees that are best suited and have good survival rates are cottonwood, golden willow, blue spruce, and Rocky Mountain juniper. Shrubs best suited include purpleosier willow, common chokecherry, and Siberian peashrub.

This soil is well suited to use as habitat for wetland wildlife. The development of excavations and potholes as open-water areas can increase waterfowl and shore bird populations. This soil supports excellent nesting cover for waterfowl.

This Acasco soil is poorly suited to homesite development. The main limitations are wetness, flooding, seepage, and frost action. Soil drainage is necessary for any type of construction on this soil. Drainage outlets can be difficult to obtain. The pollution hazard from flooding and wetness makes an onsite sewage disposal system undesirable. Alternative systems for waste disposal, such as community sewage systems, should be provided.

This soil is in capability subclasses IIIw, irrigated, and VIw, nonirrigated. It is in the Wet Meadow range site.

2—Alamosa clay loam. This deep, nearly level, poorly drained soil is on flood plains and fans on alluvial valley floors. Elevation is 7,500 to 8,000 feet. The soil formed in alluvium. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 95 days.

Included in this unit are a few small areas of Vastine loam and Torsido loam.

Typically, the surface layer of this Alamosa soil is grayish brown clay loam about 3 inches thick. The subsoil, about 29 inches thick, is mainly grayish brown clay loam. The substratum to a depth of 60 inches is pale brown gravelly loamy sand. Yellowish brown and pale olive mottles are common throughout the profile.

Permeability is moderately slow. Effective rooting depth is limited by a seasonal high water table that fluctuates between depths of 1.0 foot and 1.5 feet. Surface runoff is slow, and the hazard of erosion is slight. This soil is subject to flooding during the spring runoff period.

This soil is used for alfalfa, small grains, hayland, and range. The high water table may damage crops. Border and sprinkler irrigation methods are suitable for this soil. Drainage, irrigation water management, timing of water application, and fertilization increase crop yields.

The potential natural vegetation on this Alamosa soil is dominated by slender and western wheatgrass on the drier areas and by tufted hairgrass, bluejoint reedgrass, and Nebraska sedge on the wetter areas. Greasewood and rabbitbrush are present but widely spaced. If the range condition deteriorates, the proportion of more desirable species decreases, and that of foxtail barley, greasewood, sedges, and rushes increases.

Seeding rangeland is difficult because of the high water table and low rainfall. Drainage, renovating, deferred grazing, rotational grazing, and brush control help prevent range deterioration.

This soil supports habitat for such wildlife as deer, cottontail, and jackrabbit. Wildlife populations can be increased by using proper livestock grazing practices and allowing wetland areas to develop. Shallow water developments provide habitat for wetland wildlife.

This soil is poorly suited to homesite development. The main limitations are wetness, flooding, and moderately slow permeability. For roads, the main limitations are low load-bearing strength, flooding, and frost action. The use of this soil as septic tank absorption fields is limited by the moderately slow permeability and the high water table. Alternative systems for waste disposal, such as community sewage systems, should be provided.

This soil is in capability subclasses IIIw, irrigated, and Vw, nonirrigated. It is in the Wet Meadow range site.

3—Alamosa clay loam, saline. This deep, nearly level, poorly drained soil is on flood plains and fans on alluvial valley floors. Elevation is 7,500 to 8,000 feet. The soil formed in alluvium. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 95 days.

Included in this unit are a few small areas of Vastine loam and Hapney clay loam.

Typically, the surface layer of this Alamosa soil is grayish brown clay loam about 3 inches thick. The subsoil is mainly grayish brown clay loam about 29 inches thick. The substratum to a depth of 60 inches or more is pale brown gravelly loamy sand.

Permeability is moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is moderately high. Surface runoff is slow, and the hazard of erosion is slight. This soil is subject to flooding during the spring runoff period. A seasonal high water table is at a depth of 1.0 foot to 1.5 feet.

The Alamosa soil is used for alfalfa, small grains, pasture, hay, and range. The high water table causes waterlogging of the soil and damages crops. Saline soil conditions affect the choice and yields of crops. Border and sprinkler irrigation methods are suitable for this soil. Irrigation water management and fertilization increase crop yields. Drainage, use of soil amendments, such as gypsum, and leaching of salts are necessary for crop production.

The potential natural vegetation on this soil is dominated by alkali sacaton, slender and western wheatgrass, creeping wildrye, Nebraska sedge, and Baltic rush. Black greasewood and rabbitbrush are present but widely spaced. If the range condition deteriorates, the proportion of more desirable species decreases, and that of foxtail barley, black greasewood, sedges, and rushes increases.

Seeding rangeland is difficult because of salinity, high water table, and low rainfall. Deferred grazing, rotational grazing, and brush control help prevent range deterioration.

Areas of this soil support such wildlife as deer, cottontail, and jackrabbit. Wildlife habitat on this soil can be improved by livestock grazing practices that allow wetland areas to develop. Shallow water developments provide habitat for wetland wildlife.

This Alamosa soil is poorly suited to homesite development. The main limitations are the high water table and flooding. For roads, the main limitations are low load-bearing strength, frost action, and flooding. The use of this soil as septic tank absorption fields is limited by flooding and the high water table. Alternative systems for waste disposal, such as community sewage systems, should be provided in areas where ground water may be polluted.

This soil is in capability subclass IIIw, irrigated, and Vw, nonirrigated. It is in the Salt Meadow range site.

4—Arena loam. This moderately deep, nearly level, poorly drained, saline-alkali affected soil is on flood plains and fans on alluvial valley floors. Elevation is 7,500 to 7,800 feet. The soil formed in alluvium. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 100 days.

Included in mapping, and making up as much as 50 percent of the map unit, are barren alkali spots, or slick spots, where no plants will grow, and small areas of Hooper clay loam and Mosca loamy sand, all having slopes of 0 to 1 percent.

Typically, the surface layer of this Arena soil is light brownish gray heavy loam about 10 inches thick. In the upper part, the underlying material is light yellowish brown loam about 24 inches thick and has dark grayish brown mottles. In the lower part, it is a pale brown silica-cemented hardpan of sandy clay loam, grading to yellowish brown clay loam, that extends to a depth of 60 inches. Depth to the silica-cemented hardpan ranges from 20 to 40 inches.

Permeability is moderately slow above the hardpan and slow in the pan. Surface runoff is slow, and the hazard of erosion is slight. A seasonal high water table is 1 foot to 2 feet below the surface. Occasional flooding occurs during the spring runoff periods.

This Arena soil is used mainly as range and wildlife habitat. Most of the acreage is poorly suited to irrigation. Alfalfa, barley, and oats can be grown, but drainage, subsoiling, and adding gypsum or sulfuric acid are necessary to produce these crops.

Border and sprinkler irrigation methods are suitable for this soil. Sprinkler irrigation is suited to most crops. Borders are suitable for alfalfa, small grains, and pasture. Regardless of the irrigation method used, water must be applied carefully to avoid perching water on the hardpan.

The potential natural vegetation on this soil is dominated by black greasewood, rubber rabbitbrush, and inland saltgrass. If the range deteriorates, the proportion of black greasewood and rubber rabbitbrush increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Seeding rangeland is not advisable because of the low rainfall and alkali conditions. Deferred grazing, cross fencing, stockwater developments, and brush control help to prevent deterioration of the range and promote the growth of more desirable plants.

Areas of this soil support such wildlife as antelope, jackrabbit, cottontail, horned lark, and lark bunting. Shallow water areas can be developed for wetland wildlife species; however, availability of water is a limitation that should be considered.

This Arena soil is poorly suited to homesite development. The main limitations are flooding and wetness. For roads, the main limitations are frost action and flooding. Septic tank absorption fields can contaminate the ground water. Dikes or levees may be necessary to prevent seasonal flooding.

This soil is in capability subclasses VIs, irrigated, and VIIs, nonirrigated. It is in the Chico Land range site.

5—Biedell clay loam. This deep, poorly drained, saline-alkali affected soil is on old dry lakebeds and depressions on alluvial valley floors. Elevation is 7,500 to

8,000 feet. This soil formed in alluvium derived principally from basalt. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 95 days.

Included in this unit are a few small areas of Laney loam, San Luis sandy loam, and Mosca loamy sand.

Typically, the surface layer of this Biedell soil is light gray clay loam about 3 inches thick. The subsoil, about 24 inches thick, is light yellowish brown clay loam and is commonly mottled. The substratum to a depth of 60 inches is very pale brown clay loam in the upper 5 inches and light brownish gray gravelly sand below. Mottles are common in the profile, which also has visible concretions and salt spots.

Permeability is very slow. Effective rooting depth is limited by a seasonal high water table that fluctuates between depths of 2 and 3 feet most of the summer. Available water capacity is low. Surface runoff is slow, and the hazard of erosion is slight. The soil is subject to flooding in the spring and summer.

This Biedell soil is used mainly for range and as wildlife habitat. It is poorly suited to irrigated cropland because of flooding, the high salt and alkali content, and the water table.

The potential natural vegetation on this soil is dominated by inland saltgrass, creeping wildrye, and scattered black greasewood. If the range condition deteriorates, the proportion of desirable grasses, such as creeping wildrye, decreases, and that of black greasewood and inland saltgrass increases.

Seeding rangeland is not recommended because of the flood hazard and the high salt and alkali content of the soil. Deferred grazing, cross fencing, and brush control help to prevent range deterioration and promote the growth of more desirable plant species.

Wildlife uses on this soil are limited because the soil does not have the potential for good habitat. Jackrabbit, cottontail, and coyote are typical of the wildlife on this soil. Wetland wildlife can use this soil if wetland areas are created by excavation or pothole blasting.

This soil is poorly suited to homesite development. The main limitations are the seasonal high water table, flooding, shrink-swell potential, very slow permeability, and high alkalinity.

This soil is in capability subclass VIIw. It is in the Alkali Overflow range site.

6—Big Blue clay loam, 0 to 3 percent slopes. This deep, poorly drained soil occurs on flood plains and terraces on alluvial valley floors. Elevation is 7,700 to 8,200 feet. The soil formed in fine textured, calcareous alluvium. The average annual precipitation is about 10 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 90 days.

Included in this unit are small areas of Gerrard loam, Hagga clay loam, and Vastine loam, all having slope of 0 to 1 percent.

Typically, the surface layer of this Big Blue soil is gray clay loam 5 inches thick. The next layer is brown loam 6 inches thick over brown clay loam 5 inches thick. In the upper 10 inches, the subsoil is light brownish gray clay loam with strong brown mottles. In the lower 12 inches, it is light gray clay loam with strong brown mottles. The substratum to a depth of 60 inches is light gray gravelly sandy clay loam. Strong brown mottles are common in the substratum.

Permeability is moderately slow. Effective rooting depth is limited by a seasonal high water table that fluctuates between depths of 0.5 and 1.0 foot most of the summer. Surface runoff is slow, and the hazard of erosion is slight. Flooding is frequent but of brief duration.

This Big Blue soil is used principally for range and irrigated pasture and hayland.

The potential natural vegetation on this soil is dominated by slender and western wheatgrass on the drier parts and by tufted hairgrass, bluejoint reedgrass, Baltic rush, and Nebraska sedge on the wettest part. If the range deteriorates, the proportion of more desirable forage species decreases, and that of the less desirable plants, such as foxtail barley, Baltic rush, forbs, and woody shrubs, increases. Undesirable weeds and annual plants invade and become more abundant as range condition declines.

Seeding rangeland is difficult because of the soil wetness. Control of excess surface and subsurface water, renovating, deferred grazing, rotational grazing, cross fencing, and brush control prevent range deterioration and promote the growth and increase of more desirable plant species.

If the soil is irrigated for pasture or hayland, land leveling, drainage, and use of commercial fertilizer along with manure and plant residue are needed. Drainage systems must be maintained and irrigation water managed properly to prevent waterlogging of the soil and salt buildup in the root zone. Drainage outlets commonly are difficult to obtain.

The border method of irrigation is suitable for this soil. The width of the irrigated strip of land between the borders and the length of run can be adjusted to help prevent water loss, waterlogging of the soil, and salt buildup.

The grassland habitat on this soil supports such wildlife as antelope, jackrabbit, cottontail, horned lark, and lark bunting. Proper grazing use, fencing that allows for free movement of antelope, and development of livestock watering facilities help rangeland wildlife populations to increase. Shallow water areas can be developed for wetland wildlife.

This soil is poorly suited to homesite development. The main limitations are flooding, wetness, moderately

slow permeability, and shrink-swell potential. Soil drainage is necessary for any type of construction on this soil. Drainage outlets can be difficult to obtain. Dikes or levees may be needed to prevent seasonal flooding. Wetness and moderately slow permeability of the soil make the use of septic tank absorption fields undesirable. Alternative systems for waste disposal, such as community sewage systems, should be used to prevent ground water pollution.

This soil is in capability subclasses Vw, irrigated, and Vw, nonirrigated. It is in the Wet Meadow range site.

7—Big Blue-Gerrard complex, 0 to 3 percent slopes. These poorly drained soils are on flood plains and terraces on alluvial valley floors. Elevation is 7,700 to 8,200 feet. The soils formed in fine textured, calcareous alluvium. The average annual precipitation is about 10 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 90 days.

Big Blue soils make up about 50 percent of this unit, and Gerrard soils make up about 40 percent. Hagga loam and Vastine loam make up the rest.

Big Blue soils are deep, poorly drained soils on flood plains and terraces. Typically, the surface layer is gray clay loam 5 inches thick. The next layer is brown loam 6 inches thick over brown clay loam 5 inches thick. In the upper 10 inches, the subsoil is light brownish clay loam and has strong brown mottles. In the lower 12 inches, it is light gray clay loam, gleyed, with strong brown mottles. The substratum to a depth of 60 inches is light gray gravelly sandy clay loam and commonly has strong brown mottles.

In Big Blue soils, permeability is moderately slow. Effective rooting depth is limited by a seasonal high water table that fluctuates between depths of 0.5 and 1.0 foot during the spring and summer. Surface runoff is slow, and the hazard of erosion is slight. Flooding is frequent but of brief duration.

Gerrard soils are deep, poorly drained soils on terraces and flood plains. Typically, the surface layer is dark gray loam 4 inches thick. The next layer is very dark grayish brown gravelly clay loam about 4 inches thick. The subsoil is grayish brown gravelly sandy clay loam about 4 inches thick. The substratum to a depth of 60 inches is mainly light brown very gravelly loamy sand. Distinct yellowish brown mottles are common in the subsoil. In some areas, the surface layer is clay loam.

In the Gerrard soils, permeability is moderate. Effective rooting depth is limited by a water table that fluctuates between depths of 1 foot and 1.5 feet. Surface runoff is slow, and the hazard of erosion is slight.

This Big Blue-Gerrard complex is used mainly as range. Some irrigated crops of alfalfa and small grains are grown.

The potential natural vegetation on these soils is dominated by slender and western wheatgrass on the drier parts and by tufted hairgrass, bluejoint reedgrass, Baltic rush, and Nebraska sedge on the wettest part. If the range deteriorates, the proportion of more desirable grasses decreases, and that of sedges, rushes, and woody shrubs increases.

Seeding rangeland is difficult because of the wetness. Control of the excess surface and subsurface water, renovating, deferred grazing, rotational grazing, cross fencing, and limited brush control help prevent range deterioration.

Border irrigation is most suitable for these soils, and the addition of commercial fertilizers, manure, and crop residue is needed to produce good yields. The width of the irrigated strip of land between the borders and the length of run can be adjusted to help prevent water loss, waterlogging, and salt buildup. Drainage is needed for best yields.

These soils support habitat for wildlife such as antelope, jackrabbit, cottontail, horned lark, and lark bunting. Proper grazing use and development of watering facilities for livestock improve wildlife habitat. Shallow water areas may be developed for wetland wildlife.

These soils are poorly suited to homesite development. The main limitations are flooding, wetness, frost action, restricted permeability, and shrink-swell potential. Soil drainage is needed for any type of construction on these soils. Drainage outlets can be difficult to obtain. The use of these soils as septic tank absorption fields is limited because of the moderate permeability and the high water table.

These soils are in capability subclasses Vw, irrigated, and Vlw, nonirrigated. They are in the Wet Meadow range site.

8—Big Blue-Hagga, dry complex. These deep, nearly level, poorly drained soils are on flood plains and terraces on alluvial valley floors. Elevation is 7,700 to 8,200 feet. The average annual precipitation is 8 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 90 days. The Big Blue soils make up about 45 percent of the map unit, and the Hagga soils make up about 45 percent. Big Blue soils differ from the Hagga soils by having more than 35 percent clay.

About 10 percent of the unit is made up of Gerrard loam and Vastine loam.

The Big Blue soils are deep and poorly drained. They formed in fine textured, calcareous alluvium. Typically, the surface layer is gray clay loam 5 inches thick. The next layer is brown loam 6 inches thick over brown clay loam 5 inches thick. In the upper 10 inches, the subsoil is light brownish gray loam and has strong brown mottles. In the lower 12 inches, it is gleyed, light gray clay loam and has strong brown mottles. The substratum to a depth of 60 inches is light gray gravelly sandy clay loam. Strong brown mottles are common in the substratum.

In the Big Blue soils, permeability is moderately slow. Effective rooting depth is limited by a seasonal high water table that fluctuates between depths of 0.5 and 1.0 foot most of the summer. Surface runoff is slow to very slow, and the hazard of erosion is slight. Flooding is frequent but of brief duration.

The Hagga soils are deep and poorly drained and are on terraces and low flood plains on alluvial valley floors. They formed in calcareous alluvium. Typically, the surface layer is brown loam 7 inches thick. The next layer is light brownish gray clay loam about 25 inches thick. The underlying layers consist of gray clay loam about 8 inches thick over gleyed, very dark grayish brown sandy clay loam about 11 inches thick. The next layer is pale brown sandy loam that extends to a depth of 60 inches.

In the Hagga soils, permeability is moderately slow. The effective rooting depth is limited by a seasonal high water table that fluctuates between depths of 0.5 and 1.0 foot most of the summer. Surface runoff is slow to very slow, and the hazard of erosion is slight.

These soils are used principally for range, irrigated pasture, and hayland.

The potential natural vegetation on the Big Blue soils is dominated by slender and western wheatgrass on the driest parts, and by tufted hairgrass, bluejoint reedgrass, and Nebraska sedge on the wettest part. If the range deteriorates, the proportion of more desirable forage species decreases, and that of foxtail barley, Baltic rush, forbs, and woody shrubs increases. Undesirable weeds and annual plants invade and become abundant as the range condition declines.

The potential natural vegetation on the Hagga soils is dominated by alkali sacaton, western and slender wheatgrass, alkali cordgrass, creeping wildrye, Nebraska sedge, and Baltic rush. Black greasewood and rabbitbrush are widely spaced. If the range deteriorates, the proportion of more desirable forage species decreases, and that of sedges, rushes, foxtail barley, and black greasewood increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Establishing rangeland seedings is difficult because of the high water table and the low rainfall. Control of excess surface and subsurface water, renovating, deferred grazing, rotational grazing, cross fencing, and brush control prevent range deterioration and promote the growth and increase of more desirable plant species.

If these soils are irrigated, protection from flooding, land leveling, leaching of salts, and the use of commercial fertilizer, manure, and plant residue are needed for best plant production. Drainage systems are needed and must be maintained. Irrigation water must be managed properly to prevent waterlogging of the soil and salt buildup in the root zone.

The border method of irrigation is suitable for these soils. The width of the irrigated strip of land between the borders and the length of run can be adjusted to help prevent water loss, waterlogging of the soil, and salt buildup.

The grassland habitat supports such rangeland wildlife as antelope, jackrabbit, cottontail, horned lark, and lark bunting. Proper livestock grazing management, fencing that allows for free movement of antelope, and livestock water developments increase rangeland wildlife populations. If water is available, shallow water areas can be developed for wetland wildlife species; however, availability of water is a limitation that must be considered.

These soils are poorly suited to homesite development. The main limitations are flooding, wetness, high frost action potential, and shrink-swell potential. Providing drainage is necessary for any type of construction on these soils. Drainage outlets can be difficult to obtain. The use of these soils as septic tank absorption fields is limited because of the moderately slow permeability and the high water table. Alternative systems for waste disposal, such as community sewage systems, should be provided to prevent ground water pollution.

This complex is in capability subclasses Vw, irrigated, and Vw, nonirrigated. The Big Blue soils are in the Wet Meadow range site, and the Hagga soils are in the Salt Meadow range site.

9—Bushvalley cobbly loam, 3 to 45 percent slopes. This shallow, well drained soil is on mountain side slopes and ridges. Elevation is 8,400 to 9,500 feet. The soil formed in colluvium from igneous rock. The average annual precipitation is about 18 inches; the average annual air temperature is about 36 degrees F; and the average frost-free period is about 60 days.

Included in this unit are small areas of Gelkie loam that have slope of 3 to 25 percent.

Typically, the surface layer of this Bushvalley soil is dark brown cobbly loam about 4 inches thick. The subsoil is brown, extremely cobbly clay loam about 9 inches thick. Hard conglomerate bedrock is at a depth of 13 inches.

Permeability is moderately slow. Effective rooting depth is about 13 inches. Available water capacity is low. Surface runoff is medium on slopes of less than 15 percent and rapid on steeper slopes. The hazard of erosion ranges from moderate to very high.

This soil is used mainly for range and woodland.

The potential natural vegetation on this soil is dominated by Arizona fescue and mountain muhly, with smaller amounts of Parry oatgrass, blue grama, and bluegrasses. If the range condition deteriorates, the proportion of Arizona fescue and mountain muhly decreases, and that of blue grama, squirreltail, ring muhly, forbs, and woody shrubs increases. Ponderosa pine is widely spaced throughout areas of this soil.

Undesirable shrubs, weeds, and annual plants invade and become abundant as the range condition declines.

Seeding rangeland on this Bushvalley soil is limited to broadcasting because of cobbly surfaces on steep slopes, shallow soil depth, and large stones. Deferred grazing, cross fencing, and stockwater developments are generally needed to prevent range deterioration and to permit growth of more desirable plants.

This soil provides woodland habitat to wildlife such as blue grouse, snowshoe hare, and black bear. Areas of this soil are also used as summer range for bighorn sheep, mule deer, and elk. Wildlife populations can be increased by proper grazing use. Additionally, this may allow greater productivity of the grasses and forbs that are palatable to deer and elk.

This Bushvalley soil is suited to the production of ponderosa pine. It is capable of producing about 1,640 cubic feet of wood per acre or 4,900 board feet (International Rule) of merchantable timber from a fully stocked, even-aged stand of 80-year old trees. The main limitations to the use of this soil for timber are stones on the soil surface, excessive slope, and the severe erosion hazard. The stones can influence felling, yarding, and other operations involving use of equipment. Because of the steepness and shallowness of this soil, special attention must be given to minimizing soil erosion. The low available water capacity can affect the rate of seedling survival.

This soil is poorly suited to homesite development. The main limitations are slope, shallow soil depth, and stones. Cuts made to provide essentially level building pads can expose the underlying bedrock. Erosion is a hazard in the steeper areas. Only the part of the site that is used for construction should be disturbed. The limitation of large stones on the soil surface can be overcome by using heavy equipment when preparing building sites, roads, and streets. Septic tank absorption fields do not function on this soil because of the steep slopes and shallow depth to bedrock.

This soil is in capability subclass VIIs. It is in the Shallow Loam range site.

10—Bushvalley-Gelkie-Rock outcrop complex, 3 to 65 percent slopes. These soils are on mountain side slopes and toe slopes. Elevation is 8,400 to 9,500 feet. The average annual precipitation is about 18 inches; the average annual air temperature is about 36 degrees F; and the frost-free period is about 60 days. The Bushvalley soils make up about 45 percent of the map unit, the Gelkie soils make up about 30 percent, and Rock outcrop makes up about 20 percent.

The Bushvalley soils are shallow and well drained. They formed on mountain side slopes, in colluvium from igneous rocks. Slope is 3 to 65 percent.

Typically, the surface layer of the Bushvalley soils is dark brown cobbly loam about 4 inches thick. The subsoil is brown, extremely cobbly clay loam about 9 inches thick. Hard bedrock is below a depth of 13 inches.

Permeability in the Bushvalley soils is moderately slow. Effective rooting depth is about 13 inches. Available water capacity is very low. Surface runoff is medium on slopes of less than 15 percent and rapid on the steeper slopes. The hazard of erosion is moderate to very high.

The Gelkie soils are deep and well drained. They formed on mountain side slopes and toe slopes, in colluvium from igneous rock. Slope ranges from 3 to 25 percent. Typically, the surface layer is grayish brown loam about 4 inches thick. The next layer is grayish brown clay loam 9 inches thick. The subsoil is brown gravelly clay loam about 11 inches thick. The substratum is calcareous, pale brown gravelly loam in the upper 18 inches. Below this, to a depth of 60 inches, it is calcareous, pale brown very gravelly loam.

Permeability in the Gelkie soils is moderate. Effective rooting depth is 60 inches. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate.

Rock outcrop occurs as large or steep escarpments of exposed rhyolite and closely associated volcanic and conglomerate materials.

This unit is used mainly as range and wildlife habitat.

The potential natural vegetation on the Bushvalley soils is dominated by Arizona fescue, Parry oatgrass, junegrass, and mountain muhly, with small amounts of blue grama and bluegrasses. If the range condition deteriorates, the proportion of Arizona fescue, junegrass, and mountain muhly decreases, and that of blue grama, woody shrubs, and forbs increases. Ponderosa pine, pinyon, and juniper are scattered throughout areas of this soil.

The potential natural vegetation on the Gelkie soils is dominated by western wheatgrass, Arizona fescue, and needleandthread, with bottlebrush squirreltail, elk sedge, and junegrass in smaller quantities. If the range deteriorates, the proportion of western wheatgrass and Arizona fescue decreases, and that of woody shrubs, forbs, annuals, and bluegrass increases.

Seeding rangeland on this complex is limited to broadcasting because of large stones, slope, and, in the Bushvalley soils, shallowness to bedrock. Deferred grazing and stockwater developments are generally needed to prevent range deterioration.

Areas of this complex support habitat for blue grouse, jackrabbit, coyote, and black bear. This complex is used as summer range for bighorn sheep, mule deer, and elk. Productivity for wildlife is lower on the Bushvalley soils than on the Gelkie soils. Proper livestock grazing practices allow greater productivity of the grasses, shrubs, and forbs palatable to big game.

The Bushvalley soils are suited to the production of ponderosa pine. They are capable of producing about 1,640 cubic feet of wood per acre or 4,900 board feet (International Rule) of merchantable timber from a fully

stocked, even-aged stand of 80-year old trees. The main limitations to the use of these soils for timber production are stones on the soil surface, excessive slope, and the severe erosion hazard. The stones can influence felling, yarding, and other harvesting operations involving the use of equipment. Erosion on skid trails and roads must be kept to a minimum. The low available water capacity can affect the rate of seedling survival.

The soils of this complex are poorly suited to homesite development. The main limitations are slope, shallow depth in the Bushvalley soils, large stones, and Rock outcrop. Deep cuts made to provide nearly level building pads can expose the underlying bedrock of the Bushvalley soils. Slope is the most limiting factor on the Gelkie part of this complex. Preserving the existing plant cover during construction helps to control erosion. Excavating for roads and buildings increases the hazard of erosion.

This complex is in capability subclass VIIs. Bushvalley soils are in the Shallow Loam range site, and Gelkie soils are in the Mountain Loam (10- to 14-inch precipitation zone) range site.

11—Bushvalley-Tellura complex, 9 to 65 percent slopes. These soils are on ridges and mountain side slopes. Elevation is 8,600 to 10,000 feet. The average annual precipitation is about 18 inches; the average annual air temperature is about 36 degrees F; and the frost-free period is about 60 days.

The Bushvalley soils make up about 45 percent of the map unit, the Tellura soils make up about 40 percent, and Rock outcrop makes up about 15 percent. Included in this unit are small areas of similar soils that are moderately deep over bedrock.

The Bushvalley soils are shallow and well drained. They formed in colluvium from igneous rock. Slope ranges from 9 to 65 percent. Typically, the surface layer is dark brown cobbly loam about 4 inches thick. The subsoil is brown extremely cobbly clay loam about 9 inches thick. Hard bedrock is below a depth of 13 inches.

Permeability in the Bushvalley soils is moderately slow. Effective rooting depth is about 13 inches. Available water capacity is very low. Surface runoff is medium to rapid, and the hazard of erosion is moderate to very high.

The Tellura soils are deep, well drained, and very cobbly. They formed in colluvium from igneous rocks. Slope ranges from 9 to 65 percent. Typically, the surface layer is dark gray very cobbly loam about 13 inches thick. The subsoil is brown very cobbly heavy clay loam about 24 inches thick. The substratum to a depth of 48 inches is very pale brown extremely cobbly clay loam and is underlain by hard bedrock.

Permeability in these Tellura soils is slow. Available water capacity is low. Runoff is medium to rapid, and the hazard of erosion is moderate to very high.

These soils support habitat for such wildlife as bighorn sheep, jackrabbit, and coyote, as well as elk and mule deer in the summer and fall. A planned grazing management system allows greater productivity of the plants palatable to wildlife.

These soils are poorly suited to homesite development. The main limitations are slope, large stones, and in the Bushvalley soils, shallowness to bedrock. Blasting is required if the shallow Bushvalley soils or the rock outcrops are excavated. Septic tank systems can not function properly on these soils because of the shallowness and steepness.

These soils are in capability subclass VIIs and the Shallow Loam range site.

12—Comodore very stony loam, 25 to 65 percent slopes. This shallow, well drained soil is on ridges and mountain side slopes. Elevation is 9,500 to 12,000 feet. The soil formed in colluvium from igneous and metamorphic rocks. The average annual precipitation is about 16 inches; the average annual air temperature is about 40 degrees F; and the frost-free period is about 60 days.

Included in this unit are small areas of Rock outcrop, Uracca very cobbly loam, and Bushvalley cobbly loam.

Typically, the surface layer of this Comodore soil is grayish brown very stony loam about 5 inches thick. The underlying material is pale brown very stony loam about 10 inches thick and is directly over hard igneous or metamorphic bedrock.

Permeability is moderate. Available water capacity is low. Effective rooting depth ranges from 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is very high.

This Comodore soil is used for recreation, range, woodland, and wildlife habitat.

The potential natural vegetation on this soil is dominated by pinyon pine and juniper, with an understory of true mountainmahogany, mountain muhly, and Indian ricegrass. If the range deteriorates, the proportion of Indian ricegrass decreases, and that of blue grama, threeawn, yucca, pricklypear, and woody shrubs increases.

The Comodore soil is suited to the production of pinyon pine. It is capable of producing about 5 cords per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot. The primary limitations to wood production are the steepness and shallowness of the soil and the large stones. Steep slopes and large stones limit the use of equipment. Measures to control erosion are necessary. Shallowness and large stones can affect the rate of seedling survival.

Seeding rangeland is not recommended on this soil because of the very steep and rocky slopes and the low rainfall. Deferred grazing is generally needed to prevent range deterioration and to promote the growth of desirable plants.

Areas of this soil support habitat for such wildlife as deer, elk, coyote, and cottontail. Forage production is low, and livestock grazing management is needed in areas where wildlife and livestock share the range.

This soil is poorly suited to recreation because of steep slopes, stoniness, and depth to bedrock; however, it is used for hunting and hiking.

This soil is poorly suited to homesite development. The main limitations are very steep slopes, large stones, and shallowness to bedrock. Heavy equipment and blasting are necessary for most uses on this soil. Special attention is needed to disturb vegetation as little as possible in order to keep soil loss to a minimum.

This soil is in capability subclass VIIs. It is in the Pinyon-Juniper Woodland range site.

13—Comodore-Rock outcrop complex, 40 to 65 percent slopes. These soils are in the mountainous areas of the county. Elevation is 9,500 to 12,000 feet. The average annual precipitation is about 16 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 60 days. Comodore soils make up about 55 percent of the complex, and the Rock outcrop makes up about 45 percent.

The Comodore soils are shallow and well drained soils that formed in thin colluvium from igneous and metamorphic rocks. Typically, the surface layer is grayish brown very stony loam about 5 inches thick. The underlying material is pale brown very stony loam about 10 inches thick and is directly over hard igneous or metamorphic bedrock at a depth of 10 to 20 inches.

Permeability is moderate. Effective rooting depth ranges from 10 to 20 inches. Available water capacity is low. Surface runoff is rapid, and the hazard of erosion is very high.

Rock outcrop consists of large or steep mountainous areas of exposed rhyolite and closely associated volcanic and conglomerate materials. In some areas, escarpments are nearly vertical.

These soils are used for range, recreation, woodland, and wildlife habitat.

The potential natural vegetation is dominated by pinyon pine and juniper, with an understory of true mountainmahogany, mountain muhly, and Indian ricegrass. If the range deteriorates, the proportion of Indian ricegrass decreases, and that of blue grama, threeawn, yucca, pricklypear, and woody shrubs increases.

The Comodore soils are suited to the production of pinyon pine. They can produce about 5 cords per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot. The primary limitations to wood production are steep slopes, large stones, shallowness, and areas of Rock outcrop. Steep slopes and large stones limit the use of equipment and make erosion control measures necessary. Shallow soils and large stones can affect the rate of seedling survival. In some places, open stands of Englemann spruce and subalpine fir are on north-facing slopes.

Seeding rangeland is not recommended on this complex because of the extremely steep slopes, large stones, low rainfall, and areas of Rock outcrop.

Areas of this complex support habitat for such wildlife as deer, elk, coyote, and cottontail. Forage production is low.

The soils are poorly suited to recreation uses because of stoniness, slope, and shallowness to bedrock. However, it is used for hunting and hiking.

The soils in this complex are poorly suited to homesite development. The main limitations are Rock outcrop, steep slopes, large stones, and shallowness to bedrock. The use of heavy equipment and blasting are necessary for developing roads or trails. Special attention is needed to disturb vegetation as little as possible in order to keep soil loss to a minimum.

These soils are in capability class VIII and the Pinyon-Juniper Woodland range site.

14—Corlett-Hooper complex, 0 to 15 percent slopes. These moderately well drained, alkali soils are on terraces and fans adjacent to old creek channels and in old lake basins on alluvial valley floors. Elevation is 7,600 to 7,900 feet. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the frost-free season is about 95 days.

Corlett soils on low dunes and terraces on valley floors make up about 50 percent of the unit, and Hooper soils on valley floors make up about 40 percent. Small areas of Hapney, Hagga, and Space City soils, included in mapping, make up 10 percent of the unit.

Corlett soils formed in alkaline eolian sands and, typically, occur as low dunes having slope ranging from 3 to 15 percent. These dunes range from 2 feet to 15 feet in height and from a few square yards to 5 or 10 acres in size. Typically, the surface layer is pale brown fine sand 7 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray fine sand.

In the Corlett soils, permeability is rapid. The effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, and the hazard of soil blowing is high. A high water table is at a depth of 3.5 to 6.0 feet during summer months.

Hooper soils formed in alluvium derived from basalt and have a wind deposited sandy surface layer. Slope ranges from 0 to 3 percent. The Hooper soils are in the low areas between the dunes and generally are found in intricate patterns with the Corlett soils. Typically, the surface layer of the Hooper soils is light gray loamy sand about 4 inches thick. The subsoil is pale brown clay about 26 inches thick. The substratum to a depth of 60 inches or more is light gray gravelly sand. Visible lime

concretions are common above the contrasting sand and gravel.

In the Hooper soils, permeability is very slow below the sandy surface layer. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, and the hazard of erosion is slight. The hazard of soil blowing is high. A seasonal water table is generally at a depth of 4 to 6 feet in summer.

The depth to the seasonal high water table varies with the topography. Some of the lake basins have water near the surface, and this generally is the level of water under the entire complex. The water table commonly is several feet below the tops of the dunes.

These Corlett and Hooper soils are used as range and wildlife habitat.

The potential natural vegetation on the Corlett soils is black greasewood, rubber rabbitbrush, inland saltgrass, fourwing saltbush, alkali sacaton, and Indian ricegrass. The potential natural vegetation on the Hooper soils is nearly all black greasewood, but inland saltgrass and rubber rabbitbrush grow in the wetter areas. Large areas of the complex are bare of vegetation. If the range deteriorates, the proportion of alkali sacaton decreases, and that of inland saltgrass, forbs, woody shrubs, and bare areas increases.

Seeding rangeland is not recommended because of low rainfall, irregular topography, and the presence of salt and alkali. Deferred grazing, cross fencing, brush control, and stockwater developments are generally needed to prevent range deterioration and to promote the growth and increase of desirable plants.

The soils in this complex are poorly suited to wildlife habitat because of low vegetative production. Wildlife on these soils include jackrabbit, cottontail, and coyote, as well as many rodent species. Proper grazing management practices benefit both wildlife and livestock. In areas where ponding occurs and shallow water areas can be developed, waterfowl and other wildlife use this unit.

These soils are poorly suited to homesite development. Soil blowing is a hazard on the Corlett soils. On the Hooper soils, the main limitations are clayey texture, high sodium content, and wetness. Special care is needed to prevent caving if Corlett soils are excavated. On both soils, plant cover should be disturbed as little as possible during construction to minimize soil blowing. Sewage lagoons and trench-type sanitary landfills can contaminate underground water because of rapid permeability in the lower part of these soils. These soils are not suited to septic tank absorption fields because of the high water table and poor filter materials. Ponds and reservoirs constructed on sandy areas of this unit require sealing to prevent seepage.

The soils in this complex are in capability subclass VIIe, nonirrigated. Corlett soils are in the Sand Hummocks range site, and Hooper soils are in the Chico Land range site.

15—Costilla gravelly loamy sand, 0 to 3 percent slopes. This deep, somewhat excessively drained soil is on fans and terraces on alluvial valley floors. The soil formed in sandy alluvium. Elevation is 7,600 to 8,000 feet. The average annual precipitation is about 8 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 95 days.

Included in this unit are small areas of Graypoint gravelly sandy loam and Mosca loamy sand, both having slope of 0 to 3 percent.

Typically, the surface layer of this Costilla soil is dark yellowish brown gravelly loamy sand in the upper 10 inches and yellowish brown gravelly loamy sand in the lower 8 inches. Between depths of about 18 inches and 60 inches is a layer of light yellowish brown gravelly loamy sand in which concentrated lime has accumulated.

Permeability is moderately rapid. The effective rooting depth is 60 inches or more. The available water capacity is low. Surface runoff is slow, and the hazard of soil blowing is high.

This soil is used as range and wildlife habitat and for irrigated crops of alfalfa, potatoes, and small grains. Sprinkler irrigation is most suitable for this soil, and adding commercial fertilizers, manure, and crop residue is necessary for good yields. Use of minimum tillage practices and planting high-residue crops help prevent soil blowing.

The potential natural vegetation on this Costilla soil is dominated by Indian ricegrass, needleandthread, and thickspike wheatgrass, with small amounts of spike dropseed, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and thickspike wheatgrass decreases, and that of blue grama, sand dropseed, threeawn, pricklypear, forbs, and woody shrubs increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Establishing rangeland seedings on this Costilla soil is difficult because of low rainfall and droughtiness. Deferred grazing, cross fencing, stockwater developments, and brush control are needed to prevent range deterioration and to promote the growth and increase of more desirable plants.

Such wildlife as antelope, cottontail, coyote, and jackrabbit are best adapted to habitat on this droughty soil. Forage production is typically low, and proper livestock grazing management is necessary if wildlife and livestock share the range. Livestock watering developments are important and are used by various wildlife species.

This soil is suited to homesite development. The main limitation is seepage. Shoring is commonly needed during excavation to prevent caving. Sewage lagoons or reservoirs require sealing to prevent seepage of the effluent. Community sewage systems are needed to prevent contamination of water supplies by seepage. The native vegetation should be disturbed as little as

Figure 4.—Deep Sand range site on Baca Grant. Cotopaxi sand is in the foreground, and Dune land and Sangre de Cristo Range are in the background.

possible during any construction in order to keep soil blowing losses to a minimum.

This soil is in capability subclasses IVe, irrigated, and VIIe, nonirrigated. It is in the Sandy Bench range site.

16—Cotopaxi sand, 2 to 15 percent slopes. This deep, somewhat excessively drained soil is on dunelike hills and ridges on alluvial valley floors. The soil formed in eolian sand. Elevation is 7,500 to 7,900 feet. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the frost-free season is about 90 days.

Included in this unit are a few small areas of Space City loamy sand, Ouray loamy sand, and Laney loam.

Typically, the surface layer of this Cotopaxi soil is brown sand about 7 inches thick. The underlying material to a depth of 60 inches or more is pale brown sand.

Permeability is rapid. The effective rooting depth is 60 inches or more. The available water capacity is low. Surface runoff is slow, and the hazard of soil blowing is high.

The soil is used predominantly for range, wildlife habitat, and recreation.

The potential natural vegetation on this Cotopaxi soil is dominated by Indian ricegrass, needleandthread, and blowoutgrass, with small amounts of spike dropseed, sand dropseed, blue grama, and a few forbs (fig. 4). If the range deteriorates, the proportion of Indian ricegrass, needleandthread, spike dropseed, and sand dropseed decreases, and that of threeawn, spiny muhly, blue grama, and forbs increases. Undesirable weeds, annuals, and woody shrubs invade and become more abundant as the range condition declines.

Establishing rangeland seedings on this soil is difficult because of the low rainfall, droughtiness, and soil blowing hazard. Deferred grazing, brush control, and stockwater developments help prevent range deterioration and promote the growth and increase of more desirable plant species.

This soil supports habitat for such wildlife as antelope, cottontail, jackrabbit, and coyote. Forage production is low, and livestock grazing management is necessary if wildlife and livestock share the range.

As much of the unit is near the Sand Dunes National Monument, recreation includes hiking and sightseeing. The hazard of soil blowing is very high if the native vegetation is removed.

This soil is suited to homesite development. The main limitation is slope. Shoring is commonly needed during excavation to prevent caving. Sewage lagoons or reservoirs require sealing to prevent seepage. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of

water supplies as a result of seepage from onsite sewage disposal systems. The vegetation should be disturbed as little as possible during any construction to keep soil blowing and water erosion to a minimum.

This soil is in capability subclass VIIe. It is in the Deep Sand range site.

17—Crestvale loam. This deep, somewhat poorly drained soil is on fans and terraces on alluvial valley floors. Elevation is 7,700 to 8,000 feet. The soil formed in loamy alluvium that is high in calcium sulfate (gypsum). The average annual precipitation is about 8 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 95 days.

Included in this unit are small areas of Hapney clay loam, Harlem clay, and Laney loam, all having slope of 0 to 1 percent.

Typically, the surface layer of this Crestvale soil is very pale brown loam about 30 inches thick, with concentrated calcium sulfate in fine crystalline and powdery forms. In the upper part, the underlying material is light grayish brown clay loam about 12 inches thick, and in the lower part, to a depth of 60 inches or more, it is grayish brown sandy loam.

Permeability is moderately slow. Effective rooting depth is limited by a high water table that fluctuates between depths of 2.5 and 3.5 feet most of the summer. Surface runoff is slow, and the hazard of erosion is slight.

This soil is used mainly for range.

Potential natural vegetation on this Crestvale soil is dominated by alkali sacaton, alkali cordgrass, and greasewood. Rubber rabbitbrush, inland saltgrass, and western wheatgrass are prominent but widely spaced. If the range deteriorates, the proportion of the more desirable grasses, such as alkali sacaton and western wheatgrass, decreases, and that of greasewood, rabbitbrush, and saltgrass increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Establishing rangeland seedings is difficult because of the low rainfall. Irrigation is necessary to leach salts from the surface layer and to permit seedling development. Deferred grazing, cross fencing, stockwater developments, and brush control help in preventing range deterioration and promote growth of more desirable plant species.

This soil supports habitat for such wildlife as antelope, cottontail, coyote, and jackrabbit. Forage production is typically low, and proper livestock grazing management is necessary if wildlife and livestock share the range.

This soil is poorly suited to homesite development. The main limitations are the high gypsum content and the seasonal high water table. Alternative systems for waste disposal, such as community sewage systems, should be provided in areas where ground water might be polluted. Concrete and steel structures require special protection from corrosion if installed on this soil.

This soil is in capability subclasses IVsw, irrigated, and VIIs, nonirrigated. It is in the Salt Flats range site.

18—Cryaquolls and Histosols, nearly level. These deep, poorly drained soils are on terraces and flood plains adjacent to small tributaries and streams on alluvial valley floors. Elevation is 8,400 to 10,000 feet. The slope is 0 to 3 percent. The average annual precipitation is about 20 inches; the average annual air temperature is about 35 degrees F; and the frost-free period is about 40 to 70 days.

Cryaquolls make up about 70 percent of the map unit, and Histosols make up about 30 percent.

Cryaquolls are deep or moderately deep to sand or very gravelly sand. These poorly drained soils formed in mixed alluvium on terraces and flood plains.

No one profile is typical of Cryaquolls, but commonly, the surface layer is very dark gray loam about 4 to 24 inches thick. The upper part of the underlying material is sandy loam, gravelly loam, or clay loam that has many prominent mottles and is about 15 to 40 inches thick. The lower part is gravelly or cobbly sandy loam or loamy sand that is mottled and several feet thick.

Permeability is moderate in the Cryaquolls. The effective rooting depth is limited by a high water table that fluctuates between 0.5 foot and 2.5 feet most of the year. Surface runoff is slow, and the hazard of erosion is slight. Cryaquolls are subject to flooding during the spring months.

Histosols are deep, poorly drained organic soils formed in low lying swales, old oxbows, and wet areas.

Commonly, the surface layer is black muck that varies in thickness and degree of decomposition. The next layers consist of peat that varies in degree of decomposition. The layers below the peat consist of sand or sand and gravel. The water table is within 1.5 feet of the surface during most of the year. Histosols are subject to flooding during the spring months.

Permeability is moderately rapid in the Histosols. Runoff is slow, and the hazard of erosion is slight.

The soils in this map unit are used as summer range and wildlife habitat.

The potential natural vegetation is dominated by tufted hairgrass, sedges, and slender wheatgrass. Also present are rush, iris, clover, cinquefoil, and willow in scattered areas. If the range deteriorates, the proportion of tufted hairgrass and slender wheatgrass decreases, and the proportion of sedges, iris, cinquefoil, and forbs increases. Undesirable weeds, such as yarrow, rose, false hellebore, and shrubs, invade and become more abundant as the range condition declines.

Seeding rangeland is difficult because of wetness and the high cost of seedbed preparation. Deferred grazing, cross fencing, and brush control are needed to prevent

range deterioration and to promote growth of more desirable plant species.

Populations of wetland wildlife, especially waterfowl and shore birds, would be increased by development of shallow water areas through excavation or pothole blasting. The potential for shallow water developments is high because of the presence of a high water table. Livestock grazing should be carefully managed so that the vegetative cover used for nesting by waterfowl is not destroyed.

The soils in this unit are poorly suited to homesite development. The main limitations are flooding and wetness. Road designs for areas of these soils must offset the limited ability of the soils to support a load and the hazard of frost action in the soil.

The soils in this map unit are in capability subclass VIw and the Mountain Meadow range site.

19—Decross loam, 1 to 15 percent slopes. This deep, well drained soil is on valley side slopes, fans, and terraces. Elevation is 8,400 to 9,300 feet. The average annual precipitation is about 18 inches; the average annual air temperature is about 35 degrees F; and the frost-free period is about 55 days.

Included in this unit are small areas of Comodore very stony loam, Bushvalley cobbly loam, and Seitz very stony loam.

Typically, the surface layer of this Decross soil is grayish brown loam about 6 inches thick. The subsoil is brown clay loam about 24 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown clay loam.

Permeability is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the hazard of erosion is moderate.

This soil is used principally as range and wildlife habitat and for some recreational uses.

The potential natural vegetation on this soil is dominated by western wheatgrass, bluegrass, Arizona fescue, and needlegrasses, with smaller amounts of slender wheatgrass, Parry oatgrass, and mountain muhly. If the condition of the range deteriorates, the proportion of Arizona fescue and western wheatgrass decreases, and that of bluegrasses, rabbitbrush, weeds, and woody forbs increases.

Seeding rangeland on this Decross soil is limited because of the cold climate and short growing season. Species recommended for seeding are pubescent and intermediate wheatgrass, smooth brome, and big bluegrass. Seedbed preparation should be done on the contour to minimize runoff and soil loss. Midsummer (late June) seedings have proven successful. Deferred grazing, stockwater development, and cross fencing are generally needed to help prevent range deterioration and to promote the growth and increase of more desirable species.

This soil supports habitat for such wildlife as blue grouse, coyote, jackrabbit, and cottontail. It is also used as summer range for mule deer and elk. Wildlife productivity can be increased through proper livestock water development. This may allow greater productivity of forage species that are palatable to wildlife.

Recreation on this unit is mainly hunting, hiking, and sightseeing.

This soil is suited to homesite development. The main limitations are shrink-swell potential and slope. Erosion is a hazard in the steeper areas. Only the part of the site that is used for construction should be disturbed. If this soil is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field.

This soil is in capability subclass VIe. It is in the Mountain Loam (10- to 14-inch precipitation zone) range site.

20—Derrick very gravelly loam, 0 to 3 percent slopes. This deep, well drained soil is on fans and terraces on alluvial valley floors. Elevation is 7,600 to 7,900 feet. The soil formed in medium textured gravelly alluvium. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 95 days.

Included in mapping are small areas of Graypoint gravelly sandy loam and San Arcacio sandy loam.

Typically, the surface layer of this Derrick soil is pale brown very gravelly loam about 4 inches thick. In the upper 5 inches, the subsoil is yellowish brown very gravelly sandy clay loam, and in the lower 4 inches, it is yellowish brown very gravelly heavy sandy loam that contains visible calcium carbonate. The substratum to a depth of 60 inches is extremely gravelly sand and has about 20 percent cobblestones.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, and the hazard of erosion is slight.

Most areas of this soil are used for range and wildlife habitat. A few areas are used for irrigated pasture and hayland. Applications of commercial fertilizer, manure, and plant residue are needed on the irrigated areas.

Irrigation systems suitable for this soil are border systems that have short lengths of run and sprinkler systems.

The potential natural vegetation on this Derrick soil is dominated by blue grama, Indian ricegrass, western wheatgrass, needleandthread, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and western wheatgrass decreases, and that of blue grama, threeawn, snakeweed, and rabbitbrush increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Establishing rangeland seedings is difficult on this soil because of the low rainfall and low available water

capacity. Deferred grazing, cross fencing, and stockwater developments help to prevent range deterioration and promote the growth of more desirable plants.

If this soil is used as range, it has limited potential for wildlife habitat because of low vegetative production. In nonirrigated areas, the best use is for such wildlife as jackrabbit, cottontail, and coyote. If this sparsely vegetated soil is used for wildlife habitat, proper livestock grazing management is necessary. If this soil is irrigated, crop residue from oats and barley can provide food for ring-necked pheasant and waterfowl.

This soil is suited to homesite development. The main limitations are large amounts of gravel and cobblestones. This soil is a good source of sand, gravel, and roadfill material. Caving of cutbanks is a hazard if areas of this soil are excavated. In some places, septic tank systems and trench-type sanitary landfills can cause ground water contamination because of the very rapid permeability of the substratum.

This soil is in capability subclass IVs, irrigated, and VIIs, nonirrigated. It is in the Mountain Outwash range site.

21—Des Moines gravelly clay loam, dry, 0 to 2 percent slopes. This deep, well drained soil is on alluvial valley floors and fans. Elevation is 7,600 to 8,000 feet. The soil formed in alluvium derived from igneous rock. The average annual precipitation is about 12 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 95 days.

Included in mapping are small areas of Platoro loam, Derrick very gravelly loam, and San Arcacio sandy loam, all having slopes of 0 to 1 percent.

Typically, the surface layer of this Des Moines soil is gray gravelly clay loam about 6 inches thick. The subsoil, about 11 inches thick, is gray very gravelly silty clay loam in the upper part and gray very gravelly sandy clay loam in the lower part. The substratum to a depth of 60 inches or more is light brownish gray very cobbly sandy clay loam that grades to light brownish gray extremely cobbly sandy clay loam.

Permeability is moderately slow. Effective rooting depth is about 60 inches. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight.

This soil is used as native range. Some small areas are used for irrigated alfalfa. Border and furrow methods of irrigation are suited to this soil. Land leveling and adjusted lengths of run are needed for proper water distribution.

The potential natural vegetation on this Des Moines soil is dominated by blue grama, Indian ricegrass, western wheatgrass, needleandthread, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and western wheatgrass decreases, and that of blue grama, threeawn, snakeweed, and rabbitbrush increases. Undesirable weeds invade and become more abundant as the range condition declines.

Seeding rangeland is difficult on this soil because of the low rainfall and moderate available water capacity. Deferred grazing, cross fencing, and stockwater developments help prevent range deterioration and promote the growth of more desirable plants.

If not irrigated, this soil has limited potential for wildlife habitat because of low vegetative production. This soil supports such wildlife as jackrabbit, cottontail, and coyote, as well as various rodents. If this soil is used for wildlife habitat and range, proper livestock grazing management is necessary. In irrigated areas, crop residue from alfalfa and small grains provides food for pheasant and waterfowl.

This soil is suited to homesite development. The main limitations are the large number of cobblestones throughout the profile and the moderate shrink-swell potential. Use of this soil for local roads and streets is somewhat limited by frost action, cobblestones, and shrink-swell potential. If this soil is used for septic tank absorption fields, the limitation of moderately slow permeability can be overcome by placing the absorption field below the subsoil and by increasing the size of the absorption field.

This soil is in capability subclasses IVs, irrigated, and VIIe, nonirrigated. It is in the Mountain Outwash range site.

22—Dune land. Dune land is in the southeastern corner of the survey area. Most of the acreage of the Great Sand Dunes National Monument is of this land type.

The dunes, which are made up of constantly shifting sand, may be as high as 600 feet. This sand has been deposited by the wind, presumably by southwesterly winds that blow across the San Luis Valley. Surface runoff is very slow, permeability is very rapid, and the available water capacity is very low. The hazard of soil blowing is high.

There is little or no vegetation on the dunes; thus, wildlife is for the most part transitory. Some weeds, lemon scurfpea, prairie sandreed, and blowoutgrass grow in low depressions or on the peripheral areas. Major uses of the dunes are for recreation and sightseeing.

This miscellaneous area is in capability class VIII.

23—Dunul very gravelly sandy loam. This deep, nearly level, somewhat excessively drained soil is on fans and terraces on alluvial valley floors. Elevation is 7,600 to 8,000 feet. The soil formed in very gravelly alluvium. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 95 days.

Included in this unit are small areas of Graypoint gravelly sandy loam and Norte gravelly sandy loam, both having slope of 0 to 1 percent.

Typically, the surface layer of this Dunul soil is brown very gravelly sandy loam about 6 inches thick. The underlying material to a depth of 60 inches is pale brown very gravelly sand that is strongly calcareous in the upper part.

Permeability is very rapid. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, and the erosion hazard is slight. The hazard of soil blowing is moderate.

This soil is used as range and for irrigated cropland, pasture, and hayland. Crops normally grown include alfalfa, potatoes, and small grains. Commercial fertilizers, plant residue, and manure are generally needed. Nonlegumes respond to nitrogen and phosphate fertilizers, and legumes respond to phosphate fertilizers.

Sprinkler irrigation is well suited to all crops grown on this gravelly soil. Proper application of irrigation water is essential in order to prevent water loss and salt buildup in the surface layer of the soil.

The potential natural vegetation on this Dunul soil is dominated by blue grama, Indian ricegrass, western wheatgrass, needleandthread, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and western wheatgrass decreases, and that of blue grama, threeawn, snakeweed, and rabbitbrush increases. Undesirable weeds and annual plants invade and are more abundant as the range condition declines.

Seeding rangeland is very difficult because of the low rainfall and low available water capacity. Deferred grazing, cross fencing, and stockwater developments help to prevent range deterioration and promote the growth of more desirable plant species.

This soil has low potential for rangeland wildlife habitat because of low production of vegetation. It supports habitat for such wildlife as jackrabbit, cottontail, and coyote, as well as various rodents. In irrigated areas, crop residue from alfalfa and small grains provides food for pheasant and waterfowl.

This soil is suited to homesite development. The main limitations are the hazard of caving if this soil is excavated and the content of cobblestones. Shoring is commonly needed during excavation to prevent caving. Sewage lagoons and trench-type sanitary landfills can cause pollution of ground water. This soil is a good source of roadfill material, sand, and gravel.

This soil is in capability subclasses IVs, irrigated, and VIIs, nonirrigated. It is in the Mountain Outwash range site.

24—Garita gravelly loam, 0 to 3 percent slopes. This deep, well drained soil is on fans. Elevation is 7,600 to 8,600 feet. The soil formed in calcareous, gravelly alluvium derived principally from basalt. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 95 days.

Included in this unit are small areas of Luhon loam and Travelers very stony loam, both having slope of 0 to 3 percent.

Typically, the surface layer of the Garita soil is brown gravelly loam about 3 inches thick. The upper 6 inches of the underlying material is brown gravelly loam; and below this, is white very gravelly loam, about 12 inches thick, that has concentrated accumulations of calcium carbonate. The lower part of the underlying material to a depth of 60 inches or more is very pale brown very gravelly loam.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, and the hazard of erosion is slight.

This soil is used mainly as range. A few small areas are within irrigated fields.

Irrigation systems suitable for this soil are border systems that have short lengths of run and sprinkler systems. Commercial fertilizer, manure, and plant residue are needed on the irrigated areas.

The potential natural vegetation on this soil is dominated by winterfat, fourwing saltbush, Indian ricegrass, and blue grama. If the range deteriorates, the proportion of these more desirable plants decreases, and that of plants such as threeawn, pricklypear, snakeweed, pingue, and other forbs increases. Undesirable weeds and annual plants invade and become more abundant as range condition declines.

Establishing rangeland seedings is difficult on this site because of the low rainfall. Deferred grazing, cross fencing, and development of stockwater facilities are the practices most needed to prevent range deterioration and to promote the growth of more desirable plant species.

This Garita soil has limited potential for wildlife habitat because of low vegetative production. In nonirrigated areas, the soil is best suited to habitat for such wildlife as antelope, jackrabbit, cottontail, and coyote. If the soil is irrigated, crop residue from oats and barley may provide food for ring-necked pheasant and waterfowl.

This soil is suited to homesite development. The main limitation is the large number of rock fragments. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems. Seepage and pollution of ground water can occur if this soil is used for sewage lagoons or trench-type sanitary landfills.

This soil is in capability subclasses IVs, irrigated, and VIIe, nonirrigated. It is in the Limy Bench range site.

25—Garita gravelly loam, 3 to 25 percent slopes. This deep, well drained soil is on fans and foot slopes. Elevation is 7,600 to 8,600 feet. The soil formed in

calcareous, gravelly alluvium derived principally from basalt. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 95 days.

Included in this unit are small areas of Travelers very stony loam, Luhon loam, and basalt Rock outcrop.

Typically, the surface layer of this Garita soil is brown gravelly loam about 3 inches thick. The underlying material to a depth of about 6 inches is brown gravelly loam. Below this, to a depth of about 21 inches, is white very gravelly loam that has a moderate marly layer of concentrated calcium carbonate. From a depth of 21 to 60 inches, the soil is very pale brown very gravelly loam that has less calcium carbonate than the layer above.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

This soil is used as range and for wildlife habitat.

The potential natural vegetation on this Garita soil is dominated by winterfat, fourwing saltbush, Indian ricegrass, and blue grama. If the range deteriorates, the proportion of these more desirable plants decreases, and that of plants such as threeawn, pricklypear, snakeweed, pingue, and other forbs increases. Undesirable weeds and annual plants invade and become more abundant as range condition declines.

Establishing rangeland seedings is difficult on this soil because of the low rainfall. Deferred grazing, cross fencing, and stockwater developments are the practices most needed to prevent range deterioration and to promote the growth of more desirable plant species.

This Garita soil has limited potential for wildlife habitat because of sparse vegetation. The soil is best suited to habitat for wildlife such as antelope, jackrabbit, cottontail, and coyote.

This soil is suited to homesite development. The main limitations are slope and the large number of rock fragments throughout the soil profile. Gravel and cobblestones should be removed from areas that are to be landscaped, particularly if these areas are used for lawns. Slope limits the use of this soil as septic tank absorption fields, and absorption lines should be installed on the contour. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems.

This soil is in capability subclass VIIe, nonirrigated. It is in the Limy Bench range site.

26—Garita-Platoro complex, 1 to 9 percent slopes. These deep, well drained soils occur on fans and terraces on alluvial valley floors. Elevation is 7,600 to 8,400 feet. The average annual precipitation is about 8 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 95 days.

The Garita soils make up 55 percent of the unit, and the Platoro soils make up about 40 percent. Garita soils differ from the Platoro soils by having a layer of concentrated calcium carbonate and a greater percentage of rock fragments. Luhon loam and Rock River gravelly loam make up about 5 percent of the unit.

The Garita soils are deep, well drained, very gravelly soils. They formed in calcareous, gravelly alluvium derived principally from basalt. Typically, the surface layer is brown gravelly loam about 3 inches thick. The underlying material to a depth of about 9 inches is brown gravelly loam. Below this to a depth of about 21 inches is white very gravelly loam that has concentrated accumulations of calcium carbonate. Between the depths of 21 and 60 inches, the soil is pale brown very gravelly loam and has less calcium carbonate than the layer above.

In the Garita soils, permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight.

The Platoro soils are deep and well drained. They formed in alluvium derived mainly from igneous rocks. Typically, the surface layer is light brownish gray loam about 8 inches thick. The subsoil is brown clay loam in the upper 9 inches and calcareous, brown gravelly clay loam in the lower 4 inches. The upper part of the substratum, about 12 inches thick, is brown very gravelly loam with visible calcium carbonate; and the lower part of the substratum, extending to a depth of 60 inches or more, is light brownish gray very gravelly loamy sand.

In Platoro soils, permeability is moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is slight. The hazard of soil blowing is moderate.

These soils are used mainly for range, and a few small areas are used for irrigated pasture.

Irrigation methods suitable for this complex are the border, furrow, and sprinkler methods. Land leveling and proper lengths of run are needed to prevent water loss from seepage and the buildup of salts in the soil. On irrigated fields, applications of commercial fertilizers, manure, and plant residue are commonly needed.

The potential natural vegetation on the Garita soils is dominated by winterfat, Indian ricegrass, blue grama, and fourwing saltbush. If the range deteriorates, the proportion of these more desirable plants decreases, and that of plants such as threeawn, pricklypear, snakeweed, pingue, and other forbs increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

The potential natural vegetation on the Platoro soils is dominated by blue grama, Indian ricegrass, needleandthread, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and western wheatgrass decreases,

and that of blue grama, threeawn, snakeweed, and rabbitbrush increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Deferred grazing, cross fencing, and stockwater developments are needed to prevent range deterioration and to promote the growth of more desirable plant species.

This complex is limited for use as wildlife habitat because of low vegetative production. On nonirrigated areas, these soils are best suited to habitat for such wildlife as antelope, jackrabbit, cottontail, and coyote. If wildlife use is planned, the value of these soils to wildlife can be improved by livestock water developments and grazing management practices. If the soil is irrigated, crop residue may provide food for ring-necked pheasant and waterfowl.

These soils are suited to homesite development. The main limitation is the large content of cobblestones in the Garita soils. The sand and gravel substratum of the Platoro soils can cause seepage and pollution of ground water if these soils are used for sewage lagoons or trench-type landfills.

This complex is in capability subclasses IVe, irrigated, and VIIe, nonirrigated. The Garita soils are in the Limy Bench range site, and the Platoro soils are in the Mountain Outwash range site.

27—Gelkie loam, 3 to 25 percent slopes. This deep, well drained soil is on toe slopes and mountain side slopes. Gelkie soils formed in colluvium from igneous rock. This soil is at elevations of 8,400 to 9,500 feet. The average annual precipitation is 17 inches; the average annual air temperature is 36 degrees F; and the frost-free season is about 60 days.

Included in this unit are a few small areas of Bushvalley cobbly loam, Decross loam, and Seitz very stony loam.

Typically, the surface layer of this Gelkie soil is grayish brown loam about 4 inches thick. The next layer is grayish brown clay loam about 9 inches thick. The subsoil is brown gravelly clay loam about 11 inches thick. The substratum to a depth of 60 inches or more is calcareous, pale brown gravelly loam and very gravelly loam.

Permeability is moderate. Effective rooting depth is 60 inches or more. The available water capacity is high. Surface runoff is medium, and the erosion hazard is moderate.

This soil is used as range and wildlife habitat.

The potential natural vegetation on this Gelkie soil is dominated by Arizona fescue, western wheatgrass, and needleandthread, with bottlebrush squirreltail, elk sedge, and junegrass in smaller quantities. If the range condition deteriorates, the proportion of western wheatgrass and Arizona fescue decreases, and that of woody forbs, annuals, and bluegrass increases.

Seeding is advisable if the range is in poor condition. Species suitable for seeding are pubescent wheatgrass, intermediate wheatgrass, smooth brome, and big bluegrass. Seedbed preparation should be done on the contour or across slopes in order to minimize runoff and soil losses before grasses become established. Mid-summer (late June) seedlings have proven to be most successful. Deferred grazing, cross fencing, stockwater developments, and salt placement help prevent range deterioration and promote growth and vigor of desirable species.

This soil supports habitat for such wildlife as bighorn sheep, mule deer, elk, coyote, cottontail, and jackrabbit. Proper livestock grazing management, well designed fencing that allows free movement of big game, and livestock water developments increase wildlife populations.

This soil is suited to homesite development. The main limitations are the slope and the moderate shrink-swell potential. Road designs should provide adequate drainage for surface runoff.

This soil is in capability subclass VIe. It is in the Mountain Loam (10- to 14-inch precipitation zone) range site.

28—Gerrard loam, 0 to 3 percent slopes. This deep, poorly drained soil is on terraces, flood plains, and fans on alluvial valley floors. Elevation is 7,600 to 8,300 feet. The soil formed in alluvium. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 95 days.

Included in this unit are small areas of Platoro loam, San Arcacio sandy loam, and Torsido loam, all having slope of 0 to 1 percent.

Typically, the surface layer of this Gerrard soil is dark gray loam 4 inches thick. The subsurface layer is very dark grayish brown gravelly clay loam 4 inches thick. The subsoil is grayish brown gravelly sandy clay loam about 4 inches thick. The substratum to a depth of 60 inches is mainly light brown very gravelly loamy sand. Mottles are common in the subsoil and substratum.

Permeability is moderate. Effective rooting depth is limited by a high water table that fluctuates between depths of 1 foot and 1.5 feet during the spring and summer. Available water capacity is low. Surface runoff is slow, and the erosion hazard is slight. In some years, flooding occurs during the spring runoff season for short periods.

This Gerrard soil is used mainly for range, irrigated pasture, and hayland. In some small areas where drainage is established, it is used for irrigated crops. Protection from flooding, soil drainage, and land leveling are necessary to produce crops on this soil. If drainage is established, the soil is suited to alfalfa, grasses, and small grains. Water-tolerant plants are most suitable for pasture seeding on this soil.

The border method of irrigation is generally suitable for all crops grown.

The potential vegetation on this soil is dominated by slender and western wheatgrasses on the driest portions and by tufted hairgrass, bluejoint reedgrass, and Nebraska sedge on the wettest portions. If the range deteriorates, the proportion of these more desirable plants decreases, and that of less desirable plants, such as foxtail barley, Baltic rush, forbs, and woody shrubs, increases. Undesirable weeds and annuals invade and become more abundant as the range condition declines.

Establishing rangeland seedings on this soil is difficult because of the low rainfall. Renovating, deferred grazing, rotational grazing, cross fencing, and brush management are practices most needed to prevent range deterioration and to promote the growth and increase of more desirable plant species.

The Gerrard soil is suited to windbreaks and environmental plantings. Poor drainage and plant competiton are the principal limitations to the establishment of tree and shrub plantings. Rodent damage is also a hazard to seedlings. Continued cultivation for weed control and proper plant selection are needed to insure survival of plantings. Trees that are best adapted and have good survival rates are cottonwood, golden willow, blue spruce, and Rocky Mountain juniper. Shrubs best suited include willow, common chokecherry, and caragana.

This soil is well suited to shallow water developments that create open-water areas by excavation or pothole blasting. Developments such as these increase waterfowl and shore bird populations. This soil provides excellent nesting for waterfowl.

This soil is poorly suited to homesite development. The main limitations are flooding, wetness, and frost action potential. Drainage is necessary for any type of construction on this soil, but drainage outlets can be difficult to obtain. Septic tank systems do not function properly on this soil and can cause pollution of nearby streams.

This soil is in capability subclasses IVw, irrigated, and VIw, nonirrigated. It is in the Wet Meadow range site.

29—Graypoint gravelly sandy loam, 0 to 3 percent slopes. This deep, well drained soil is on broad fans and terraces on alluvial valley floors. Elevation is 7,600 to 8,000 feet. The soil formed in alluvium derived principally from basalt. The average annual precipitation is about 8 inches; the mean annual air temperature is about 41 degrees F; and the frost-free season is about 95 days.

Included in this unit are small areas of Derrick gravelly loam and Platoro loam, both having slope of 0 to 3 percent.

Typically, the surface layer of this Graypoint soil is grayish brown gravelly sandy loam about 4 inches thick. The subsoil is grayish brown sandy clay loam in the upper 6 inches and light brownish gray gravelly sandy clay loam in the lower 3 inches. The substratum to a depth of 60 inches is mainly pale brown very gravelly sand.

Permeability is moderate above the gravelly substratum. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, and the hazard of erosion is slight. Soil blowing is a hazard if plant residue is removed.

This soil is used as range and for irrigated cropland, pasture, and hayland. Crops grown are alfalfa, potatoes, and small grains. Applications of commercial fertilizers, manure, and plant residue are needed. Border, furrow, and sprinkler irrigation methods are suitable for this soil. Sprinkler irrigation is well suited to all crops and pasture. The furrow method is suited to row crops. Border systems that have short lengths of run are suitable for alfalfa, small grains, and pasture. Land leveling is generally necessary for border and furrow irrigation to prevent water loss, seepage, and salt buildup in the soil. Use of minimum tillage practices and high-residue crops helps prevent soil blowing.

The potential natural vegetation on this Graypoint soil is dominated by blue grama, Indian ricegrass, western wheatgrass, needleandthread, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread and western wheatgrass decreases, and that of blue grama, threeawn, snakeweed, and rabbitbrush increases. Undesirable weeds invade and become more abundant as the range condition declines.

Seeding rangeland is difficult on this soil because of the low rainfall and low available water capacity. Deferred grazing, cross fencing, and stockwater developments help to prevent range deterioration and promote the growth of more desirable plants.

Nonirrigated areas of this soil have limited use for wildlife habitat because of the low vegetative production. Wildlife that inhabit areas of this soil include jackrabbit, cottontail, and coyote, along with various rodents. If wildlife use is planned for this soil, proper livestock grazing management is necessary. If this soil is irrigated, crop residue from alfalfa and small grains may provide food for pheasant and waterfowl.

This soil is well suited to homesite development. Caving is a hazard if this soil is excavated. Septic tank systems, sewage lagoons, and trench-type sanitary landfills can cause contamination of groundwater. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems. This soil is a good source of gravel and roadfill.

This soil is in capability subclasses IVs, irrigated, and VIIe, nonirrigated. It is in the Mountain Outwash range site.

Figure 5.—Sprinkler irrigation is well suited to potatoes grown in Gunbarrel loamy sand.

30—Gunbarrel loamy sand. This deep, somewhat poorly drained, alkaline and saline soil is on terraces and low fans on alluvial valley floors. The soil formed in alluvium. Elevation is 7,600 to 7,800 feet. The average annual precipitation is about 8 inches; the average annual air temperature is about 41 degrees F; and the frost-free season is about 95 days.

Included in this unit are small areas of Mosca loamy sand and McGinty sandy loam, both having slope of 0 to 1 percent.

Typically, the surface layer of this Gunbarrel soil is grayish brown loamy sand about 5 inches thick. The upper part of the underlying material is brown and light gray, calcareous loamy sand about 23 inches thick. The lower part to a depth of 60 inches is brown and gray sand.

Permeability is rapid. Effective rooting depth is limited by a high water table that fluctuates between depths of 4.5 and 5.0 feet most of the summer in areas where soil drainage is adequate. Surface runoff is slow, and the erosion hazard is slight. The hazard of soil blowing is high if plant residue is removed.

This soil is used for range and for irrigated potatoes, alfalfa, and small grains (fig. 5). Applications of gypsum, commercial fertilizers, crop residue, and manure are generally needed. Gypsum helps leach alkali from the soil. Generally small grains, potatoes, and alfalfa respond to phosphate fertilizers.

Sprinkler irrigation is well suited to all crops and irrigated pastures on this Gunbarrel soil.

The furrow method of irrigation is well suited to row crops. Border irrigation is suited to alfalfa, small grains, and pasture. Regardless of the irrigation method used, land leveling, short lengths of run, and proper timing are needed to keep water loss at a minimum and prevent the buildup of salts in the surface layer. Water-control

structures should be installed in irrigation ditches. Use of minimum tillage practices and high-residue crops help prevent soil blowing.

The potential natural vegetation on this soil is dominated by alkali sacaton, alkali cordgrass, and greasewood. Rubber rabbitbrush and inland saltgrass are prominent but widely spaced. If the range deteriorates, the proportion of the more desirable grasses, such as alkali sacaton and western wheatgrass, decreases, and that of greasewood, rubber rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Seeding rangeland is difficult because of the low rainfall, and irrigation is necessary for seedling development. Deferred grazing, cross fencing, stockwater developments, and brush control help to prevent range deterioration and promote the growth of more desirable plant species.

This Gunbarrel soil has limited potential for wildlife habitat because of low vegetative production. Nonirrigated areas are best used for wildlife such as jackrabbit, cottontail, and coyote. If the soil is irrigated, crop residue from oats and barley can provide food for ring-necked pheasant and waterfowl.

This soil is suited to homesite development. The main limitations are seasonal wetness, high salt content, and seepage. Garden level basements can be constructed, but full basements should be avoided because the water table is at 4.5 to 5.0 feet in the summer. Soil blowing is a critical hazard wherever vegetation is disturbed. Septic tank absorption fields and trench-type sanitary landfills can cause contamination of ground water.

This soil is in capability subclasses IVe, irrigated, and VIIe, nonirrigated. It is in the Salt Flats range site.

31—Gunbarrel loamy sand, saline. This deep, poorly drained soil is severely affected by salts and alkali. It is on terraces and low fans on alluvial valley floors. Elevation is 7,600 to 7,800 feet. The soil formed in alluvium. The average annual precipitation is about 8 inches; the average annual air temperature is about 41 degrees F; and the frost-free season is about 95 days.

Included in this unit are small areas of Mosca loamy sand and McGinty sandy loam, both having slope of 0 to 1 percent.

Typically, the surface layer of this Gunbarrel soil is grayish brown loamy sand about 5 inches thick. The upper part of the underlying material is brown and light gray, calcareous loamy sand 23 inches thick. The lower part to a depth of 60 inches is brown and gray sand.

Permeability is rapid. Effective rooting depth is limited by a high water table that fluctuates between depths of 1.5 and 2.0 feet most of the summer. Surface runoff is slow, and erosion hazard is slight. The hazard of soil blowing is high if plant residues are removed.

This soil is used as range and for irrigated pasture. Salt-tolerant plants are best suited to this soil. Land leveling, soil drainage, and leaching salts from the root zone of plants are needed for growing irrigated crops on this soil. Drainage outlets can be difficult to find. The application of soil amendments such as sulfuric acid or gypsum helps in leaching salts from the soil.

Sprinkler irrigation is well suited to all crops and irrigated pasture grown on this soil. The furrow method of irrigation is well suited to row crops. Border irrigation is suited to alfalfa, small grains, and pasture. Regardless of the irrigation method used, short lengths of run and proper timing are needed to keep water loss to a minimum and prevent salt accumulation in the soil. Use of minimum tillage practices and high-residue crops help prevent soil blowing.

The potential natural vegetation on this Gunbarrel soil is dominated by alkali sacaton, alkali cordgrass, and greasewood. Rubber rabbitbrush and inland saltgrass are prominent but widely spaced. If the range deteriorates, the proportion of the more desirable grasses, such as alkali sacaton and western wheatgrass, decreases, and that of greasewood, rubber rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Seeding rangeland is difficult because of the low rainfall and salty conditions. Irrigation and leaching are necessary for seedling development. Deferred grazing, cross fencing, stockwater developments, and brush control help to prevent range deterioration and promote the growth of more desirable plant species.

This Gunbarrel soil has limited potential for wildlife because of low vegetative production. Nonirrigated areas are best used for wildlife such as jackrabbit, cottontail, and coyote. Where the soil is irrigated, crop residue from oats and barley may provide food for ring-necked pheasant and waterfowl.

This soil is poorly suited to homesite development. The main limitation is wetness. Plants that tolerate wetness, salinity, and high alkalinity should be selected for lawns. If roads are built in areas of this soil, the soil should be drained and designs of roads should be modified to offset frost action. Septic tank absorption fields do not function properly because of the high water table.

This soil is in capability subclasses IVs, irrigated, and VIIs, nonirrigated. It is in the Salt Flats range site.

32—Hagga loam, dry. This deep, poorly drained soil is on low flood plains on alluvial valley floors. Elevation is 7,700 to 8,200 feet. The soil formed in calcareous alluvium. The average annual precipitation is about 8 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 90 days.

Included in this unit are small areas of Big Blue clay loam, Gerrard loam, Laney loam, and Vastine loam, all having slope of 0 to 1 percent.

Typically, the surface layer of this Hagga soil is brown loam about 7 inches thick. The subsurface layer is light brownish gray and light gray clay loam 25 inches thick. The underlying material to a depth of 60 inches consists of stratified gray clay loam, very dark grayish brown sandy clay loam, and pale brown sandy loam.

Permeability is moderately slow. Effective rooting depth is limited by a high water table that fluctuates between depths of 0.5 foot and 1 foot most of the summer. Available water capacity is moderate. Surface runoff is slow to very slow, and the hazard of erosion is slight. Flooding occurs in low areas for short periods in some seasons.

This soil is used principally for range, irrigated pasture, and hayland.

The border method of irrigation is suitable for this soil. The width of the irrigated strip of land between the borders and the length of run can be adjusted to help prevent water loss, waterlogging of the soil, and salt buildup. Land leveling, leaching of salts, and use of commercial fertilizer, manure, and plant residue are necessary for irrigated plant production. Drainage systems must be maintained and irrigation water managed properly to prevent waterlogging of the soil and salt buildup in the root zone.

The potential natural vegetation on this Hagga soil is dominated by western and slender wheatgrasses, alkali sacaton, alkali cordgrass, inland saltgrass, creeping wildrye, Nebraska sedge, and Baltic rush. Greasewood and rabbitbrush are present but widely spaced. If the range deteriorates, the proportion of more desirable forage species decreases, and that of sedges, rushes, foxtail barley, and greasewood increases. Undesirable weeds and annual plants invade and become more abundant as range condition declines.

Establishing rangeland seedings is difficult because of wetness and low rainfall. Control of excess surface and subsurface water, renovating, deferred grazing and rotational grazing, cross fencing, and brush control prevent range deterioration and promote the growth and increase of more desirable plant species.

The grassland habitat on this soil supports such wildlife as antelope, jackrabbit, cottontail, horned lark, and lark bunting. Proper livestock grazing management, fencing that permits free movement of antelope, and livestock water developments help wildlife populations increase. If water is available, shallow water areas can be developed for wetland wildlife species; however, permanent availability of water is an important consideration.

This Hagga soil is poorly suited to homesite development. The main limitations are wetness, flooding, and high frost action potential. Soil drainage is necessary for construction on this soil, but drainage outlets can be difficult to obtain. Road designs need to be modified to offset the high frost action potential.

This soil is in capability subclasses IVw, irrigated, and VIw, nonirrigated. It is in the Salt Meadow range site.

33—Hapney clay loam. This deep, moderately well drained soil is on terraces and fans on alluvial valley floors. Elevation is 7,600 to 8,000 feet. This soil formed in alluvium. The average annual precipitation is about 8 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 95 days.

Included in this unit are small areas of Hooper clay loam, Laney loam, and San Luis sandy loam, all having slope of 0 to 1 percent. Also a few slick spots are in this unit.

Typically, the surface layer of this Hapney soil is light gray clay loam about 2 inches thick. The upper 18 inches of the subsoil is gray heavy clay loam. The lower 6 inches of the subsoil is very dark gray clay. The upper part of the substratum is light brownish gray clay about 8 inches thick, and the lower part to a depth of 60 inches is light olive gray clay loam. Mottles are in the substratum in some places.

Permeability is slow. Effective rooting depth is 60 inches. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight. This soil has a high water table at a depth of 4 to 5 feet during the irrigation season.

Most of the acreage of this soil is used for range and wildlife habitat. Small areas occur in irrigated fields that are made up mostly of other soils.

The potential natural vegetation on this soil is dominated by alkali sacaton, alkali cordgrass, and greasewood. Western wheatgrass, rubber rabbitbrush, and inland saltgrass are prominent but widely spaced. If the range deteriorates, the proportion of the more desirable grasses, such as alkali sacaton and western wheatgrass, decreases, and that of greasewood, rubber rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Deferred grazing, cross fencing, stockwater development, and brush control help prevent range deterioration and promote the growth of more desirable plant species.

This soil has poor potential for rangeland wildlife habitat because of low vegetative production. Such wildlife as jackrabbit, cottontail, and coyote inhabit the range. If areas of this soil are irrigated, crop residue from oats and barley may provide food for ring-necked pheasant and waterfowl.

This soil is poorly suited to homesite development. The main limitations are shrink-swell potential, wetness, and slow permeability. Designs for dwellings and roads can be modified to offset these limiting features. The effects of shrinking and swelling can be reduced by

maintaining a constant moisture content around the foundation or by backfilling with material that has low shrink-swell potential. Slow permeability and the high water table increase the possibility of failure of septic tank absorption fields. Alternative systems for waste disposal, such as community sewage systems, should be provided in areas where ground water pollution can occur.

This soil is in capability subclasses IVs, irrigated, and VIIs, nonirrigated. It is in the Salt Flats range site.

34—Harlem, dry-Slickspots complex. These deep, moderately well drained soils are on low terraces and flood plains on alluvial valley floors. They formed in calcareous clayey alluvium. Elevation is 7,600 to 8,100 feet. The average annual precipitation is about 8 inches. The average annual air temperature is about 41 degrees, and the frost-free period is about 90 days. The slope is 0 to 1 percent.

This map unit is made up of about 70 percent Harlem clay and about 30 percent Slickspots, which are eroded areas that are nearly barren of vegetation and are very strongly affected by salt and alkali. Included in this unit are small areas of Hapney clay loam, Hooper loamy sand, and San Luis sandy loam.

Typically, the surface layer of the Harlem soil is light brownish gray clay about 9 inches thick. The material in the next 20 inches is dominantly light gray and gray clay. The underlying material to a depth of 52 inches is variegated brown and gray heavy clay loam or clay. The material between depths of 52 and 60 inches or more is sandy clay loam.

Permeability is slow in the Harlem soil. The effective rooting depth is limited by a high water table that fluctuates between 3.5 feet and 5.0 feet most of the summer. The available water capacity is moderate. Surface runoff is slow to very slow, and the erosion hazard is slight. The hazard of soil blowing is moderate if plant residue is removed. The soil is subject to flooding for short periods in some years.

Slickspots are variable but commonly have a clay surface layer that is very high in exchangeable sodium and about 13 inches thick. The underlying material to a depth of about 22 inches is clay that is high or very high in exchangeable sodium. Below this, to a depth of 60 inches or more, the underlying material is stratified sandy clay and clay.

Permeability is very slow in Slickspots. The effective rooting depth is limited by a water table that fluctuates between 3.5 feet and 6.0 feet in spring and summer. Available water capacity is very low due to the high content of salt and alkali in the soil. Surface runoff is moderate, and ponding occurs after some rains in low concave areas. The hazard of erosion is moderate. Soil blowing is a hazard in some places because of the sparse vegetation and the high shrink-swell potential of the surface layer, which tends to granulate upon drying.

Areas of this map unit are used primarily for range; some areas are used for irrigated small grains and hay crops and as wildlife habitat. The border method of irrigation is best for these soils. Sprinklers do not function well because they become mired in the clayey soils and because the slow permeability of the soils restricts their ability to absorb water (fig. 6). Additions of fertilizer as well as manure and crop residue are necessary for good yields. Soil amendments such as gypsum or sulfuric acid will help to reclaim alkali spots and to leach salts from the root zone.

The potential natural vegetation on the Harlem soil is dominated by alkali sacaton, alkali cordgrass, and inland saltgrass. Greasewood and rubber rabbitbrush are common but widely spaced. If the range deteriorates, the proportion of the more desirable grasses, such as alkali sacaton and western wheatgrass, decreases, and that of inland saltgrass, greasewood, and rubber rabbitbrush increases. Undesirable weeds and annuals invade and become more abundant as the range condition deteriorates.

The Slickspots part of this map unit is about 50 percent areas that are barren of vegetation. The remainder is dominated by black greasewood, inland saltgrass, and rubber rabbitbrush. If the range deteriorates, the proportion of inland saltgrass decreases and that of greasewood and bare spots increases.

Establishing seedlings is very difficult because of low rainfall, very slow permeability, salinity, and alkalinity. Irrigation is necessary for seedling development. Deferred grazing, cross fencing, stockwater development, and limited brush control will help in preventing range deterioration and promoting growth.

Antelope, cottontail, coyote, and jackrabbit are the best adapted on this unit. Forage production is low, so grazing management is needed if wildlife and livestock share the range. Livestock water developments are important and are utilized by both wildlife and livestock.

The soils in this unit are poorly suited to homesite development. The main limitations are flooding in low areas, slow permeability, shrink-swell potential, wetness, salinity, and alkalinity.

The soils in this map unit are in capability subclass VIIs, nonirrigated. The Harlem soils are in the Salt Flats range site and the Slickspots are in the Chico Land range site.

35—Hooper loamy sand. This deep, nearly level, moderately well drained, saline-alkali affected soil is on flood plains and fans on alluvial valley floors (fig. 7). The soil formed in alluvium that was derived principally from basalt and had a wind deposited surface layer. Elevation is 7,500 to 8,000 feet. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 95 days.

Figure 6.—Center pivot sprinklers become mired in Harlem clay soils.

Included in this unit are small areas of Hooper clay loam, San Luis sandy loam, and Mosca loamy sand, all having slope of 0 to 1 percent.

Typically, the surface layer of this Hooper soil is pale brown loamy sand about 4 inches thick. The upper 13 inches of the subsoil is pale brown clay. The lower part of the subsoil is light gray gravelly clay loam 7 inches thick. The substratum is light gray very gravelly sand. Visible calcium carbonate concretions are common above the substratum.

Permeability is very slow below the surface layer. Effective rooting depth is 60 inches. Available water capacity is very low. Surface runoff is slow, and the erosion hazard is slight. In some places, this soil has a seasonal high water table between 4 and 6 feet.

Most of the acreage of this soil is used for range and wildlife. Small areas occur in irrigated fields comprising mostly other soils.

The potential natural vegetation on this Hooper soil is dominated by alkali sacaton, alkali cordgrass, and inland saltgrass. Black greasewood and rubber rabbitbrush are prominent but widely spaced. If the range deteriorates, the proportion of the more desirable grasses, such as alkali sacaton, decreases, and that of black greasewood, rubber rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Deferred grazing, cross fencing, stockwater developments, and brush control help to prevent range deterioration and promote the growth of more desirable plant species.

This soil has poor potential for rangeland wildlife habitat because of low vegetative production. Such wildlife as jackrabbit, cottontail, and coyote inhabit the range. If this soil is irrigated, crop residue from oats and barley may provide food for ring-necked pheasant and waterfowl.

This soil is poorly suited to homesite development. The main limitations are the clayey subsoil, shrink-swell

Figure 7.—The accumulation of salts and alkali in Hooper loamy sand results in abandoned farmsteads, slickspots, and brush.

hazard, very slow permeability, salinity and alkalinity, and wetness. Designs for dwellings and roads can be modified to offset these limitations. Foundations should be placed below the clayey subsoil. The use of this soil as septic tank absorption fields is limited by the very slow permeability. Using long absorption lines and sandy backfill for the trench helps to compensate for the very slow permeability. Alternative systems for waste disposal, such as community sewage systems, need to be provided in areas where ground water pollution can occur. Soil blowing is a hazard if plant residue is removed.

This soil is in capability subclasses VIs, irrigated, and VIIe, nonirrigated. It is in the Salt Flats range site.

36—Hooper clay loam. This deep, nearly level, moderately well drained soil is on flood plains and fans on alluvial valley floors. Elevation is 7,600 to 7,900 feet. This soil formed in alluvium derived principally from basalt. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 95 days.

Included in this unit are small areas of Hooper loamy sand, San Luis sandy loam, and Mosca sandy loam, all having slope of 0 to 1 percent. Also about 20 percent of this unit is Slickspots.

Typically, the surface layer of this Hooper soil is light gray clay loam about 4 inches thick. The upper 13 inches of the subsoil is pale brown clay. The lower part of the subsoil is gravelly clay loam 7 inches thick. The substratum to a depth of 60 inches is light gray very gravelly sand. Visible lime concretions are common above the substratum.

Permeability is very slow above the substratum. Effective rooting depth is 60 inches. Available water capacity is very low. Surface runoff is slow, and the hazard of erosion is slight. In some places, this soil has a seasonal high water table between 4 and 6 feet.

This soil is used almost entirely for range. It is poorly suited to irrigated cropland because of high alkali content and very slow permeability.

The potential natural vegetation on this Hooper soil is dominated by black greasewood, rabbitbrush, and inland saltgrass. If the range deteriorates, the proportion of inland saltgrass decreases, and that of black greasewood and Slickspots increases.

Seeding rangeland on this soil is not recommended because of the low rainfall, and because of the saline-alkali content and the very low available water capacity of the soil. Deferred grazing, cross fencing, and brush control help prevent range deterioration and promote the growth of more desirable plant species in some areas.

This soil supports habitat for a very limited variety of wildlife species. Areas of this soil typically are inhabited by such wildlife as jackrabbit and coyote.

This soil is poorly suited to homesite development. The main limitations are shrink-swell hazard, salt and alkali, and wetness. Designs for dwellings can be modified to offset these limitations. Foundations should be placed below the clayey subsoil. If this soil is used as septic tank absorption fields, seepage of effluent is a hazard because of the rapid permeability of the substratum. Alternate systems for waste disposal, such as community sewage systems, need to be provided in areas where ground water pollution can occur.

This soil is in capability subclass VIIs, nonirrigated. It is in the Chico Land range site.

37—Hopkins-Cheadle-Rock outcrop complex, 3 to 35 percent slopes. These shallow and deep, well drained soils and the Rock outcrop are on mountain side slopes and ridges. Elevation is 8,200 to 9,200 feet. The average annual precipitation is about 16 inches; the average annual air temperature is about 38 degrees F; and the frost-free period is about 80 days.

The Hopkins soils make up about 40 percent of the acreage, the Cheadle soils about 35 percent, and Rock outcrop about 25 percent.

The Hopkins soils are deep and well drained soils that formed in colluvium from rhyolite and welded tuff on ridges and mountain side slopes. Typically, the surface layer is brown channery loam about 8 inches thick. The underlying material to a depth of 7 inches is brown channery loam. Below that, and extending to a depth of 60 inches or more, are overlapping flagstones that are separated by voids 0.5 inch to 4 inches across. Depth to the overlapping flagstones ranges from 14 to 20 inches.

Permeability in these Hopkins soils is moderate. The effective rooting depth is limited by the overlapping flagstones and lack of soil material in the voids. The available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is moderate.

The Cheadle soils are shallow and well drained soils that formed in residuum and colluvium from volcanic rocks on ridges and mountain side slopes. Typically, the surface layer is brown channery loam about 9 inches thick. The underlying material is brown very channery loam about 6 inches thick over hard bedrock. Depth to bedrock ranges from 10 to 20 inches.

Permeability in these Cheadle soils is moderate. Rooting depth is 10 to 20 inches. Available water capacity is low. Surface runoff is moderate to rapid, and the hazard of erosion is high.

This complex is used as summer range and for wildlife habitat.

The potential natural vegetation on these soils is dominated by Arizona fescue, mountain muhly, and western wheatgrass, with smaller amounts of Parry oatgrass, blue grama, and junegrass. If the range deteriorates, the proportion of Arizona fescue and mountain muhly decreases, and that of blue grama, squirreltail, ring muhly, forbs, and woody shrubs increases. Undesirable shrubs, weeds, and annual plants invade and become abundant as the range condition declines.

Seeding rangeland on these soils is very difficult because of rock fragments, steep slopes, shallowness to bedrock, and low rainfall. Deferred grazing, cross fencing, and stockwater developments are needed to prevent range deterioration and to permit the growth and increase of more desirable plant species.

This complex supports such wildlife as bighorn sheep, antelope, cottontail, coyote, and jackrabbit.

These soils are poorly suited to homesite development. The main limitations are shallow soils, large rock fragments, Rock outcrop, and steep slopes. Use of heavy equipment and blasting are necessary for most construction on these soils. Natural vegetation should be disturbed as little as possible during construction in order to keep erosion to a minimum.

This complex is in capability subclass VIIs. It is in the Shallow Loam range site.

38—Humic Cryaquepts, nearly level, acid overwash. These deep, poorly drained soils are on low alluvial valley floors, adjacent to streams, at an elevation of 8,400 to 8,600 feet. They formed in mixed alluvium. From 6 to more than 20 inches of acid mine and mill tailings has been washed down and deposited on the surface. This map unit is adjacent to Kerber Creek, southeast of Bonanza.

Included in this unit are small areas of Cryaquolls, without the acid overwash, and some small sand and gravel bars. Also included are small areas of Slickspots.

No one profile is typical of Humic Cryaquepts, but commonly the surface layer is dark gray, stratified loam and clay loam with yellowish brown mottles. It is 6 to 20 inches thick and is extremely acid or very strongly acid. The underlying material to a depth of about 36 inches is very dark gray or black clay loam that is high in organic matter content and contains some fine, prominent, yellowish brown mottles. Below this depth is light gray sand or gravelly sand with fine, prominent, yellowish brown mottles.

Permeability is moderately slow. Available water capacity is very low because of the acid salts. Surface runoff is slow, and the hazard of erosion is slight. Flooding is common for short periods during spring snowmelt. The water table occurs at a depth of 1 foot to 3 feet during the growing season.

These soils are used for pasture where the acid overwash material is thin and the vegetative cover has not been completely destroyed. The native plants have been replaced by acid-tolerant plants in places. Liming, deep plowing, and seeding acid-tolerant plants are necessary to reestablish a plant cover on these soils.

The soils in this unit are poorly suited to homesite development. The main limitations are wetness, flooding, acid salts, and low load-bearing strength. For construction purposes, soil drainage, protection from flooding, use of acid-resistant building materials, and modification of design to offset the low load-bearing strength of the soils are needed.

The soils in this map unit are in capability subclass VIIw.

39—Jodero loam, 0 to 3 percent slopes. This deep, well drained soil is on alluvial fans and stream terraces. Elevation is 7,800 to 8,500 feet. The soil formed in alluvium. The average annual precipitation is about 12 inches; the average annual air temperature is about 40 degrees F; and the frost-free season is about 80 days.

Included in this unit are small areas of Lolo gravelly sandy loam and Garita gravelly loam and a few small areas of very gravelly sand and very cobbly sand. All have slope of 0 to 3 percent.

Typically, the surface layer of this Jodero soil is dark brown loam about 6 inches thick. The subsurface layer is dark brown and dark grayish brown sandy clay loam about 18 inches thick. The next layer is dark grayish brown loam about 16 inches thick. The upper part of the underlying material is grayish brown loamy sand 8 inches thick. The lower part to a depth of 60 inches or more is pale brown sandy clay loam.

Permeability is moderate. The effective rooting depth is 60 inches or more, and the available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight.

This soil is used predominantly for range. Some small areas are used for irrigated pasture and hayland.

Irrigation methods suited to this soil include the border and sprinkler methods. For border irrigation, using a proper length of run and adjusting the width of the irrigated strip of land between the borders are necessary to prevent water loss and waterlogging of the soil. Applications of commercial fertilizers, manure, and crop residue help to maintain soil productivity. Nitrogen fertilizers give best results on alfalfa and other legumes.

The potential natural vegetation on this Jodero soil is dominated by western wheatgrass, needleandthread, and fourwing saltbush. If the range deteriorates, the proportion of these desirable grasses decreases, and that of blue grama, rubber rabbitbrush, and other less desirable forbs and grasses increases. Brush plants continue to increase and weeds and annual plants become more abundant as range condition declines.

Establishing rangeland seedlings is possible on this soil especially on the more favorable areas. Adapted species are wheatgrasses and Russian wildrye. Seeding in conjunction with pitting is advisable. Late summer seedings have proven most successful. Deferred grazing, cross fencing, and stockwater developments are generally necessary to prevent range deterioration and to promote the growth and increase of more desirable plant species.

In irrigated areas, habitat favorable for mourning dove, ring-necked pheasant, and many nongame species can be developed by establishing areas for nesting and escape cover. Wildlife such as antelope and jackrabbit can be encouraged by development of livestock watering facilities and proper livestock grazing management.

This soil is well suited to homesite development. It has few limitations to this use.

This soil is in capability subclasses IIIe, irrigated, and VIe, nonirrigated. It is in the Foothill Loam range site.

40—Jodero-Lolo wet complex, 0 to 6 percent slopes. This complex consists of deep, well drained and moderately well drained soils on low terraces along drainageways. Elevation is 8,000 to 9,000 feet. These soils formed in alluvium. The average annual precipitation is about 12 inches; the average annual air temperature is about 40 degrees F; and the frost-free period is about 80 days.

The Jodero soils make up about 45 percent of the unit, and Lolo soils make up about 35 percent. Included areas of very gravelly sand or very cobbly sand make up about 20 percent of the map unit.

Typically, the well drained Jodero soils have a dark brown loam surface layer about 6 inches thick. The underlying material to a depth of 60 inches is stratified grayish brown, dark grayish brown and pale brown loam, sandy clay loam, and loamy sand.

Permeability in these Jodero soils is moderate. The effective rooting depth is 60 inches, and the available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight. The soils are subject to flooding in some years.

The moderately well drained Lolo soils typically have a dark grayish brown gravelly sandy loam surface layer about 8 inches thick. The subsurface layer is brown very gravelly sandy loam 17 inches thick. The subsoil is yellowish brown very cobbly sandy loam about 12 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely cobbly sandy loam.

Permeability in these Lolo soils is moderately rapid. The effective rooting depth is 60 inches, and the available water capacity is moderate. Surface runoff is

slow, and the hazard of erosion is slight. A high water table is at 1.5 feet to 2.5 feet below the surface for 2 to 6 weeks during the spring snowmelt season. In some places flooding occurs for brief periods in the spring.

These soils are used as range and for wildlife habitat.

The potential natural vegetation on these soils is dominated by western wheatgrass, needleandthread, and fourwing saltbush. If the range deteriorates, the proportion of these desirable grasses decreases, and that of blue grama, rubber rabbitbrush, and other less desirable forbs, grasses, and shrubs increases. Brush plants continue to increase, and weeds and annual plants become more abundant as the range condition declines.

Establishing rangeland seedlings is possible on the more favorable areas of these soils. Adapted species include wheatgrasses and Russian wildrye. Seeding in conjunction with pitting is advisable, and working on a contour or across the slope is necessary on the sloping parts of the complex. Late summer seeding has proven most successful. Deferred grazing, cross fencing, and stockwater developments are necessary to prevent range deterioration and to promote the growth and increase of the more desirable plant species. Cottonwood and willow trees make up about 10 percent of the plant community adjacent to some of the streams and are important providers of wildlife food and cover.

These soils support habitat for such wildlife as deer, antelope, jackrabbit, and cottontail, as well as various birds and rodents. Proper livestock grazing management helps to increase wildlife populations on these soils.

The soils in this complex are poorly suited to homesite development. The main limitations are wetness, flood hazard, and in the Lolo soils, the content of rock fragments. Onsite investigations are necessary to determine the most desirable areas for roads and structures. Septic tank systems do not function properly in the areas that have a high water table, and pollution of streams and ground water by the effluent is a hazard.

This complex is in capability subclass VIe, nonirrigated. It is in the Foothill Loam range site.

41—Kerber loamy sand. This deep, somewhat poorly drained salt- and alkali-affected soil is on fans and flood plains on alluvial valley floors. Elevation is 7,600 to 7,800 feet. The soil formed in alluvium derived mainly from basalt. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 90 days.

Included in this unit are small areas of Hooper loamy sand, McGinty sandy loam, Mosca loamy sand, and San Arcacio sandy loam.

Typically, the surface layer of this Kerber soil is light gray and light brownish gray loamy sand about 8 inches thick. The subsoil is light brown and pale brown sandy loam that is affected by alkali and is about 12 inches thick. The substratum, which extends to a depth of 60 inches or more, is light gray sandy loam in the upper 7 inches and grades to pale brown sand.

Permeability is moderate. Effective rooting depth is about 60 inches. Available water capacity is very low. Surface runoff is slow, and the soil blowing hazard is moderate. A high water table is between 2 and 3 feet during the irrigation season.

This soil is used as range and for irrigated pasture.

The potential natural vegetation on this Kerber soil is dominated by alkali sacaton, alkali cordgrass, and black greasewood. Rubber rabbitbrush, inland saltgrass, and western wheatgrass are prominent but widely spaced. If the range deteriorates, the proportion of the more desirable grasses, such as alkali sacaton and western wheatgrass, decreases, and that of black greasewood, rubber rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Salt-tolerant plants are best suited to this soil. Land leveling, soil drainage, and leaching salts from the root zone of plants are needed for irrigated crop production on this soil. Drainage outlets can be difficult to find. The application of soil amendments, such as sulfuric acid or gypsum, helps in leaching alkali salts from the soil if it is drained. Use of minimum tillage practices and high-residue crops helps prevent soil blowing.

The sprinkler and furrow methods of irrigation are well suited to row crops. Border and sprinkler irrigation systems are suited to alfalfa, small grains, and pasture. If the border or furrow methods are used, short lengths of run and proper timing are needed to keep water loss to a minimum and help prevent additional salt accumulation in the soil.

Establishing rangeland seedlings is very difficult because of the low rainfall, high water table, very low available water capacity, and salt and alkali condition. Irrigation is necessary for seedling development. Deferred grazing, cross fencing, stockwater development, and brush control help prevent range deterioration and promote the growth of more desirable plant species.

Where used as range, this Kerber soil has limited potential for wildlife habitat because of low vegetative production. Nonirrigated areas are best used for such wildlife as jackrabbit, cottontail, and coyote. In irrigated areas, crop residue from oats and barley provides food for ring-necked pheasant and waterfowl.

This soil is poorly suited to homesite development. The main limitation is wetness. For landscaping, plants that tolerate salt and high alkalinity are most suitable. Shoring is commonly needed to prevent cutbanks from caving. Soil drainage is needed to minimize frost heave. Septic tank absorption fields do not function properly because of the high water table.

This soil is in capability subclasses IIIw, irrigated, and VIIs, nonirrigated. It is in the Salt Flats range site.

42—Laney loam, 0 to 3 percent slopes. This deep, well drained, saline-alkali affected soil is on flood plains and fans on alluvial valley floors. Elevation is 7,600 to 7,800 feet. The soil formed in calcareous alluvium. The average annual precipitation is about 8 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 95 days.

Included in this unit are small areas of Hapney loam, San Luis sandy loam, and Hagga loam, all having slope of 0 to 1 percent.

Typically, the surface layer of this Laney soil is light brownish gray loam about 8 inches thick. The upper part of the underlying material, which extends to a depth of about 50 inches, is stratified brown and light gray loam and clay loam. The lower part to a depth of 60 inches or more is loamy coarse sand. The surface layer and upper part of the underlying material are affected by alkali in most places.

Permeability is slow to moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the erosion hazard is slight. The soil blowing hazard is moderate to high if plant residue is removed.

This soil is used mostly as range and for irrigated pasture.

Land leveling, leaching of salts, and application of commercial fertilizer, manure, and plant residue are necessary for better plant production. Drainage systems must be maintained and irrigation water managed properly to prevent waterlogging of the soil and salt buildup in the root zone of plants. Use of minimum tillage practices and high-residue crops helps prevent soil blowing.

Border and sprinkler methods of irrigation are suitable for this soil. Sprinkler irrigation is suited to most crops. Border irrigation is well suited to alfalfa, small grains, and pasture. Regardless of the irrigation method used, water must be applied carefully to prevent seepage and water loss.

The potential natural vegetation on this soil is dominated by alkali sacaton, alkali cordgrass, and inland saltgrass. Black greasewood and rubber rabbitbrush are prominent but widely spaced. If the range deteriorates, the proportion of the more desirable grasses, such as alkali sacaton and western wheatgrass, decreases, and that of black greasewood, rubber rabbitbrush, wild licorice, and inland saltgrass increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Establishing rangeland seedlings is difficult because of the low rainfall and alkali-affected surface layer. Deferred grazing, cross fencing, stockwater development, and brush control help to prevent range deterioration and promote growth of more desirable plant species.

The grassland habitat on this Laney soil supports such wildlife as antelope, jackrabbit, cottontail, horned lark, and lark bunting. Proper livestock grazing management, fencing that allows free movement of antelope, and livestock water developments help wildlife populations increase.

This soil is suited to homesite development. The main limitations are seepage, alkalinity, and shrink-swell potential. Buildings and roads can be designed to offset the effects of shrinking and swelling. The effects of shrinking and swelling on buildings can be reduced by maintaining a constant moisture content around the foundation or by backfilling with material that has low shrink-swell potential. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies by seepage.

This soil is in capability subclasses IIIs, irrigated, and VIIs, nonirrigated. It is in the Salt Flats range site.

43—Luhon loam, 0 to 3 percent slopes. This deep, well drained soil is on fans on alluvial valley floors. Elevation is 7,600 to 8,000 feet. This soil formed in calcareous alluvium. The average annual precipitation is about 10 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 95 days.

Included in this unit are small areas of Garita sandy loam, Travelers very stony loam, and Rock River gravelly loam, all having slopes of 0 to 3 percent.

Typically, the surface layer of this Luhon soil is brown loam about 7 inches thick. The underlying material to a depth of 20 inches is light gray loam that has visible calcium carbonate. Below 20 inches the soil is pinkish white loam and has less visible calcium carbonate than the layer above. This layer extends to a depth of 60 inches.

Permeability is moderate. Effective rooting depth is 60 inches. Available water capacity is high. Surface runoff is medium, and the erosion hazard is moderate. Soil blowing is a hazard if plant residue is removed.

This soil is used for range and for irrigated pasture and hayland.

The potential natural vegetation on this soil is dominated by winterfat, fourwing saltbush, Indian ricegrass, and squirreltail. If the range deteriorates, the proportion of plants such as threeawn, pricklypear, snakeweed, pingue, and other forbs increases. Undesirable weeds and annual plants invade and become more abundant as range condition declines.

Sprinkler and border irrigation methods are suitable for this Luhon soil. Land leveling and relatively short lengths of run are necessary to conserve water and prevent soil erosion. Drop structures should be installed in irrigation ditches to control water and prevent excessive ditch erosion.

Establishing rangeland seedlings is difficult on this soil because of the low rainfall. Deferred grazing, cross fencing, and stockwater developments are needed to

prevent range deterioration and to promote the growth and increase of more desirable plant species.

This soil supports habitat for such wildlife as antelope, cottontail, coyote, and jackrabbit. Forage production is typically low, and livestock grazing management practices are necessary if wildlife and livestock share the range. Livestock watering developments are also important and are used by various wildlife species. If food and cover are provided in irrigated areas, populations of such wildlife as ring-necked pheasant can be increased.

This soil is well suited to homesite development. It has few limitations to this use.

This soil is in capability subclasses IIIe, irrigated, and VIe, nonirrigated. It is in the Limy Bench range site.

44—Luhon loam, 3 to 6 percent slopes. This is a deep, well drained soil on fans and valley side slopes at elevations of 7,600 to 8,000 feet. The soil formed in calcareous alluvium. The average annual precipitation is about 10 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 95 days.

Included in this unit are small areas of Garita sandy loam, Travelers very stony loam, and Rock River gravelly loam, all having slope of 3 to 6 percent.

Typically, the surface layer of this Luhon soil is brown loam about 7 inches thick. The underlying material to a depth of 20 inches is light gray loam that has much visible calcium carbonate. Below 20 inches to a depth of 60 inches, the soil is pinkish white heavy sandy loam that has less visible calcium carbonate than the layer above.

Permeability is moderate. Effective rooting depth is 60 inches. Available water capacity is high. Surface runoff is medium, and the erosion hazard is moderate.

This soil is used as range and wildlife habitat.

The potential natural vegetation on this soil is dominated by winterfat, fourwing saltbush, Indian ricegrass, and squirreltail. If the range deteriorates, the proportion of these more desirable plants decreases; that of plants such as threeawn, pricklypear, snakeweed, pingue, and other forbs increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Establishing rangeland seedlings is difficult because of the low rainfall. Deferred grazing, cross fencing, and development of stockwater facilities are the practices most needed to prevent range deterioration and to promote the growth and increase of more desirable plant species.

This soil supports habitat for such wildlife as antelope, cottontail, coyote, and jackrabbit. Forage production is typically low, and livestock grazing management practices are necessary if wildlife and livestock share the range. Livestock watering developments are also important and are used by various wildlife species.

This soil is well suited to homesite development. Vegetative cover should be disturbed as little as possible during construction to minimize erosion.

This soil is in capability subclasses IVe, irrigated, and VIe, nonirrigated. It is in the Limy Bench range site.

45—McGinty sandy loam, 0 to 3 percent slopes. This deep, moderately well drained soil is on fans on alluvial valley floors. Elevation is 7,600 to 8,000 feet. This soil formed in calcareous alluvium derived primarily from igneous rock. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 95 days.

Included in this unit are small areas of Luhon loam, Mosca loamy sand, and Norte gravelly sandy loam, all having slope of 0 to 3 percent.

Typically, the surface layer of this McGinty soil is pale brown sandy loam about 8 inches thick. The upper part of the underlying material is pale brown sandy loam about 9 inches thick. The lower part to a depth of 60 inches is very pale brown sandy loam and pale brown fine sandy loam containing visible calcium carbonate.

Permeability is moderately rapid. Effective rooting depth is 60 inches. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table is within 4.5 to 5.0 feet of the surface during the irrigation season.

This soil is used for irrigated crops of potatoes, alfalfa, and small grains and for range.

On irrigated cropland, applications of commercial fertilizers are needed in addition to manure and crop residue. Generally, all nonlegume crops respond to phosphate fertilizer. Use of minimum tillage practices and high-residue crops helps prevent soil blowing.

Irrigation methods suitable for this soil are sprinkler, border, or furrow. Sprinkler irrigation is well suited to all crops. Furrow methods are suited to row crops, and border irrigation is suited to alfalfa, small grain, and pasture. Land leveling and relatively short lengths of run are necessary to conserve water and to prevent seepage and salt buildup in the soil.

The potential natural vegetation on this soil is dominated by Indian ricegrass, blue grama, thickspike wheatgrass, and alkali sacaton. Common shrubs are fourwing saltbush, black greasewood, and rubber rabbitbrush. If the range deteriorates, the proportion of Indian ricegrass, thickspike wheatgrass, and alkali sacaton decreases, and that of inland saltgrass, forbs, and woody shrubs increases. Black greasewood and rubber rabbitbrush increase and annual weeds invade and become more abundant as range condition declines.

Establishing rangeland seedlings on this soil is difficult because of the low rainfall. Deferred grazing, cross fencing, stockwater developments, and brush control are

needed to prevent range deterioration and to promote the growth and increase of more desirable plant species.

This soil supports habitat for such wildlife as antelope, cottontail, coyote, and jackrabbit. Forage production is typically low, and proper livestock grazing management is necessary if wildlife and livestock share the range.

If this soil is irrigated, wildlife can be encouraged to make use of small grain stubble and other crop residue for food and cover.

This soil is suited to homesite development. Garden level basements are above the water table, but underground basements are not. In places, excavation for houses and access roads exposes material that is highly susceptible to soil blowing. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems.

This soil is in capability subclasses IIIe, irrigated, and VIIe, nonirrigated. It is in the Valley Sand range site.

46—Medano fine sandy loam. This deep, nearly level, poorly drained soil is on flood plains on alluvial valley floors. Elevation is 7,500 to 8,400 feet. The soil formed in alluvium. The average annual precipitation is about 9 inches; the average annual air temperature is about 42 degrees F; and the average annual frost-free season is about 90 days.

Included in this unit are some small areas of Hagga loam, Gerrard loam, and Acasco clay loam.

Typically, the surface layer of this Medano soil is grayish brown fine sandy loam about 19 inches thick. The upper part of the underlying material is light brownish gray loamy fine sand about 11 inches thick. The lower part to a depth of 60 inches is brown loamy fine sand.

Permeability is moderately rapid. Effective rooting depth is limited by a high water table that fluctuates between depths of 1.5 and 3.0 feet most of the summer. Surface runoff is slow. The hazard of soil blowing is moderate. Rare flooding occurs in low areas in some years.

This soil is used principally for range, wildlife habitat, and limited acreages of alfalfa or hay crops. The sprinkler method of irrigation is suitable for most crops on this soil. Soil drainage and management of irrigation water are needed to prevent salt buildup, waterlogging, and water loss.

The potential natural vegetation on this Medano soil is dominated by western and slender wheatgrasses on the drier parts and by tufted hairgrass, bluejoint reedgrass, and Nebraska sedge on the wetter parts. If the range condition deteriorates, the proportion of the more desirable species decreases, and that of less desirable species increases. Weeds, annuals, and black greasewood increase in abundance as the range declines.

Establishing rangeland seedlings on this soil is difficult because of the low rainfall. Renovating, deferred grazing, rotational grazing, cross fencing, and brush control help prevent range deterioration.

This soil supports habitat for such wildlife as deer, jackrabbit, and cottontail. Wildlife on this soil can best be aided by use of proper livestock grazing practices. In some places, wetland wildlife habitat can be improved by development of shallow water areas and pothole blasting; however, permanent availability of water is a problem that must be considered.

This soil is poorly suited to homesite development. The main limitations are flooding, wetness, and low load-bearing strength (*23*). Soil drainage, flood control, and modification of designs for roads and buildings are necessary to offset these limitations.

This soil is in capability subclasses IVw, irrigated, and Vw, nonirrigated. It is in the Wet Meadow range site.

47—Medano-Hapney complex. These nearly level, poorly drained and well drained soils are on alluvial fans and flood plains on alluvial valley floors. The soils formed in alluvium. Elevation is 7,600 to 8,400 feet. The average annual precipitation is about 8 inches; the average annual air temperature is about 42 degrees F; and the frost-free period is about 90 days.

Medano soils make up about 60 percent of this unit; Hapney soils make up 30 percent; and inclusions of Hooper clay loam, Gerrard loam, and San Luis sandy loam make up the remaining 10 percent.

The Medano soils are deep, poorly drained soils on flood plains and lower fans. Typically, the surface layer is grayish brown fine sandy loam about 19 inches thick. The upper part of the underlying material is light brownish gray loamy fine sand about 11 inches thick. The lower part of the underlying material to a depth of 60 inches or more is brown loamy fine sand.

Permeability in the Medano soils is moderately rapid. Effective rooting depth is limited by a high water table that fluctuates between depths of 1.5 and 2.0 feet most of the summer. Surface runoff is slow, and the erosion hazard is slight. Rare flooding occurs in low areas in some years.

The Hapney soils are moderately well drained soils on drier areas of flood plains and fans. Typically, the surface layer is light gray clay loam about 2 inches thick. Typically, the surface layer is light gray clay loam about 2 inches thick. The upper 18 inches of subsoil is gray heavy clay loam. The lower 6 inches of subsoil is very dark gray clay. The upper part of the substratum is light brownish gray clay about 8 inches thick, and the lower part of the substratum to a depth of 60 inches is light olive gray clay loam. Some profiles have mottles in the substratum.

Permeability is slow. Effective rooting depth is 60 inches. Available water capacity is high. Surface runoff is slow, and the erosion hazard is slight. A fluctuating high

water table is between depths of 4 and 5 feet during the irrigation season.

These soils are used for range and wildlife habitat.

The potential natural vegetation on the Medano soils is dominated by western and slender wheatgrasses on the driest parts, and by tufted hairgrass, bluejoint reedgrass, and Nebraska sedge on the wetter areas. If the range condition deteriorates, the proportion of more desirable species decreases, and that of less desirable species, annuals, weeds, and woody shrubs increases as the range condition declines.

The potential natural vegetation on the Hapney soils is dominated by alkali sacaton, alkali cordgrass, and black greasewood. Western wheatgrass, rubber rabbitbrush, and inland saltgrass are prominent but widely spaced. If the range deteriorates, the proportion of alkali sacaton and western wheatgrass decreases, and that of greasewood, rubber rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become more abundant as range condition declines.

Establishing rangeland seedlings on this complex is difficult because of the low rainfall, high cost of land preparation, high water table, and high salt content. Deferred grazing, rotational grazing, and brush control are conservation practices that are helpful in preventing range deterioration and promoting the growth of more desirable plant species.

These soils support habitat for such wildlife as jackrabbit, cottontail, deer, and coyote. Proper livestock grazing practices help prevent range deterioration and help promote the growth of desirable vegetation. If these soils are irrigated, the wet areas may be used by geese and ducks.

The soils in this complex are poorly suited to homesite development. The main limitations are flooding in low areas, wetness, shrink-swell potential, and frost action. Buildings and roads can be designed to offset the effects of shrinking and swelling of the soil. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation or by backfilling with material that has low shrink-swell potential.

These soils are poorly suited to septic tank absorption fields. Medano soils are limited by wetness and poor filtering capacity; using a mound-type system helps compensate for these limitations. Hapney soils are limited by slow permeability; using sandy backfill for the trench and long absorption lines helps overcome this limitation (*29*).

These soils are in capability subclasses IVw, irrigated, and VIIs, nonirrigated. The Medano soils are in the Wet Meadow range site, and the Hapney soils are in the Salt Flats range site.

48—Monte loam, 0 to 3 percent slopes. This deep, well drained soil is on fans and flood plains on alluvial valley floors. Elevation is 7,600 to 8,600 feet. This soil formed in calcareous alluvium derived mainly from igneous rocks. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the average frost-free season is about 90 days.

Included in this unit are small areas of Luhon loam, Garita gravelly loam, and Travelers very stony loam.

Typically, the surface layer of this Monte soil is calcareous, light brownish gray loam about 12 inches thick. The underlying material to a depth of about 8 inches is calcareous, grayish brown light clay loam. Below this to a depth of 60 inches it grades to pale brown, stratified, calcareous loam and sandy loam.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow, and the erosion hazard is moderate. The soil blowing hazard is moderate if plant residue is removed.

This soil is used for range and for irrigated crops of alfalfa, barley, and oats and for irrigated pasture and hayland. Applications of commerical fertilizers, manure, and plant residue are generally needed. Generally, small grains respond to applications of nitrogen fertilizers, and alfalfa and other legumes respond to phosphate fertilizers. Use of minimum tillage practices and high-residue crops helps prevent soil blowing.

Sprinkler irrigation is well suited to all commonly grown crops and pasture. The border method of irrigation is well suited to alfalfa and small grain crops. Land leveling and proper lengths of run help to conserve water and prevent seepage and salt accumulation.

The potential natural vegetation on this Monte soil is dominated by Indian ricegrass, western wheatgrass, needleandthread, blue grama, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and western wheatgrass decreases, and that of blue grama, threeawn, snakeweed, and rubber rabbitbrush increases. Undesirable weeds and annual plants invade and become more abundant as range condition declines.

Establishing rangeland seedlings is difficult because of the low rainfall. Deferred grazing, cross fencing, and stockwater developments help to prevent range deterioration and promote the growth of more desirable plant species.

Where used as rangeland, this Monte soil has limited potential for wildlife habitat because of low vegetative production. Nonirrigated areas are best used for wildlife such as jackrabbit, cottontail, and coyote. If this sparsely vegetated soil is used for range and wildlife habitat, proper livestock grazing management is necessary. If this soil is irrigated, crop residue from oats and barley can provide food for ring-necked pheasant and waterfowl.

This soil is well suited to homesite development. The moderate permeability is a limitation to the use of this soil as septic tank absorption fields, but this limitation

can be overcome by increasing the size of the absorption field.

This soil is in capability subclasses IIIe, irrigated, and VIIe, nonirrigated. It is in the Mountain Outwash range site.

49—Morval clay loam, 3 to 6 percent slopes. This deep, well drained soil is on valley side slopes and fans. Elevation is 7,700 to 8,400 feet. The soil formed in moderately fine textured alluvium derived from igneous rocks. The average annual precipitation is about 15 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 85 days.

Included in this unit are a few small areas of Rock River gravelly loam, Garita gravelly loam, and Derrick very gravelly loam.

Typically, the surface layer of this Morval soil is dark reddish gray clay loam about 5 inches thick. The subsoil is reddish gray and reddish brown clay loam about 22 inches thick. The substratum to a depth of 60 inches is light reddish brown light clay loam and brown gravelly clay loam.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate.

This soil is used principally as range and wildlife habitat with some recreation uses.

The potential natural vegetation on this Morval soil is dominated by western wheatgrass, needleandthread, and fourwing saltbush. If the range condition deteriorates, the proportion of more desirable species, such as western wheatgrass and needleandthread, decreases and that of the less desirable species, such as blue grama, rubber rabbitbrush, forbs, and annuals increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Establishing rangeland seedlings on this soil is difficult because of low rainfall and cold climate. Species suitable for seeding are Russian wildrye, Nordan crested wheatgrass, Siberian wheatgrass, and pubescent wheatgrass. Seedbed preparation should be done on the contour to minimize soil erosion. Late summer seedings have proven most successful. Deferred grazing, stockwater developments, brush control, and erosion control structures help prevent range deterioration.

Wildlife such as antelope, cottontail, jackrabbit, and coyote are adapted to the habitat supported by this soil. Forage production is low, and livestock grazing management can help maintain wildlife habitat. Livestock water developments are beneficial for both livestock and wildlife.

Recreation on this unit is mainly hunting, hiking, and sightseeing.

This soil is suited to homesite development. The main limitation is shrink-swell potential. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential. The designs of roads built on areas of this soil must offset the soil's low load-bearing strength. Erosion is a hazard in the steeper areas. Only the part of the site that is used for construction should be disturbed.

This soil is in capability subclass VIe, nonirrigated. It is in the Foothill Loam range site.

50—Mosca loamy sand, 0 to 3 percent slopes. This deep, well drained soil is moderately affected by alkali. It is on fans and flood plains on alluvial valley floors. Elevation is 7,600 to 7,800 feet. The soil formed in alluvium derived mainly from basalt. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 90 days.

Included in this map unit are small areas of Hooper loamy sand and McGinty sandy loam.

Typically, the surface layer of this Mosca soil is very pale brown and brown loamy sand about 8 inches thick. The subsoil, about 6 inches thick, is brown sandy loam that is affected by alkali. The upper part of the substratum is brown calcareous loamy sand about 18 inches thick. The lower part to a depth of 60 inches is sand and very gravelly sand.

Permeability is moderate above the substratum. Effective rooting depth is about 60 inches. Available water capacity is low. Surface runoff is slow, and the soil blowing hazard is high.

This soil is used for irrigated potatoes, alfalfa, and small grains and for range. Applications of gypsum, commercial fertilizers, crop residue, and manure are generally needed. Gypsum helps leach alkali from the soil. Generally, small grains and potatoes respond to phosphate fertilizers. Use of minimum tillage practices and high-residue crops helps prevent soil blowing.

The sprinkler and furrow systems of irrigation are well suited to potatoes. Border and sprinkler irrigation systems are suited to alfalfa and small grains. Where border and furrow irrigation systems are used, land leveling and adjusted lengths of run are necessary to conserve water and prevent seepage and buildup of salts in the soil surface.

The potential natural vegetation on this soil is dominated by Indian ricegrass, blue grama, alkali sacaton, and thickspike wheatgrass. Black greasewood, rubber rabbitbrush, and fourwing saltbush are prominent but widely spaced. If the range deteriorates, the proportion of the more desirable grasses, such as Indian ricegrass, alkali sacaton, and thickspike wheatgrass, decreases, and that of black greasewood, rubber rabbitbrush, and blue grama increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Establishing rangeland seedlings is very difficult because of the low rainfall, low available water capacity, and alkali conditions. Deferred grazing, cross fencing,

stockwater development, and brush control help prevent range deterioration and promote the growth of more desirable plants.

Where used as range, this Mosca soil has limited potential for wildlife habitat because of low vegetative production. In nonirrigated areas, the soil is best used for habitat for wildlife such as jackrabbits, cottontail, and coyote. If the soil is irrigated, crop residue from oats and barley may provide food for ring-necked pheasant and waterfowl.

This soil is well suited to homesite development. In places, excavation for houses and access roads exposes material that is highly susceptible to soil blowing. Shoring is needed during excavations to prevent caving. Septic tank absorption fields and trench-type sanitary landfills can contaminate ground water.

This soil is in capability subclasses IIIe, irrigated, and VIIs, nonirrigated. It is in the Valley Sand range site.

51—Mount Home-Saguache complex, 2 to 25 percent slopes. These deep, well drained and somewhat excessively drained soils are on fans and terraces at elevations of 7,700 to 8,300 feet. The average annual precipitation is about 9 inches; the average annual air temperature is about 43 degrees F; and the frost-free period is about 90 days.

The Mount Home soils make up about 50 percent of the unit, and the Saguache soils make up about 35 percent. About 15 percent of the unit is Comodore very stony loam, Ouray loamy sand, and Uracca very cobbly loam.

The Mount Home soils are deep, well drained to somewhat excessively drained soils. They formed in very cobbly alluvium. Typically, the surface layer is light brownish gray very cobbly sandy loam about 16 inches thick. The underlying layers to a depth of 60 inches are very pale brown and pale brown extremely cobbly sandy loam.

Permeability in these Mount Home soils is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, and the hazard of erosion is slight to moderate.

The Saguache soils are deep and well drained. They formed in alluvium. Typically, the surface layer is light brownish gray gravelly sandy loam 8 inches thick. The next layer is light yellowish brown gravelly loamy sand 8 inches thick. The underlying material to a depth of 60 inches is pale brown very gravelly sand.

Permeability in these Saguache soils is moderately rapid. Effective rooting depth is about 60 inches. Available water capacity is low. Surface runoff is slow, and the hazard of erosion is slight.

Both the Mount Home and Saguache soils are used for range, although grass production is limited because of the cobblestone content and the thin stands of pinyon and juniper trees.

The potential natural vegetation on the Mount Home soils is dominated by western wheatgrass, needleandthread, Indian ricegrass, blue grama, and pinyon pine. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and western wheatgrass decreases, and that of blue grama, squirreltail, threeawn, snakeweed, and rabbitbrush increases. Some bushy plants, such as fourwing saltbush and true mountainmahogany, provide forage for livestock and wildlife.

The potential natural vegetation on the Saguache soils is dominated by blue grama, Indian ricegrass, western wheatgrass, needleandthread, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread and western wheatgrass decreases, and that of blue grama, threeawn, snakeweed, and rabbitbrush increases. Undesirable weeds invade and become more abundant as range condition declines.

These soils support habitat for such wildlife as antelope, deer, jackrabbit, cottontail, coyote, and various rodent species. True mountainmahogany on the Mount Home soils is a valuable browse plant for deer.

The soils in this complex are poorly suited to homesite development. The main limitations are large stones and slope. The use of heavy equipment is necessary for most construction on these soils. Septic tank absorption fields are difficult to install because of large stones, and they do not adequately filter the effluent in the Saguache soils. Sewage lagoons and trench-type sanitary landfills can cause pollution of groundwater. Caving of cutbanks is a problem if the Saguache soils are excavated.

This complex is in capability subclass VIIs, nonirrigated. Mount Home soils are in the Rocky Foothills range site, and Saguache soils are in the Mountain Outwash range site.

52—Norte gravelly sandy loam. This deep, nearly level, moderately well drained soil is on terraces and fans on alluvial valley floors. Elevation is 7,600 to 7,900 feet. The soil formed in calcareous, moderately coarse textured alluvium overlying beds of sand and gravel. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 90 days.

Included in this unit are small areas of Dunul very gravelly sandy loam, Saguache gravelly loam, and San Arcacio sandy loam, all having slope of 0 to 1 percent.

Typically, the surface layer of this Norte soil is brown gravelly sandy loam about 8 inches thick. The upper part of the underlying material is brown gravelly sandy loam about 18 inches thick. The lower part to a depth of 60 inches is light brownish gray very gravelly sand. The soil is calcareous throughout.

Permeability is rapid. Effective rooting depth is limited by a high water table that fluctuates between depths of 2.5 and 4.0 feet most of the summer. Available water

capacity is low. Surface runoff is slow, and the soil blowing hazard is moderate.

This Norte soil is used for irrigated alfalfa, barley, lettuce, and potatoes and for range (fig. 8). Applications of commercial fertilizers are generally needed in addition to manure and plant residue. Generally, small grains respond to applications of nitrogen and phosphate fertilizers. Use of minimum tillage practices and high-residue crops helps prevent soil blowing.

Sprinkler, furrow, and border irrigation methods are suitable for this Norte soil. Sprinkler irrigation is suitable for most crops. Furrows are suitable for potatoes and lettuce. Border systems that have short lengths of run are suitable for alfalfa, small grains, and pasture. Land leveling and proper length of run are needed to prevent water loss from seepage and the buildup of salts in the soil.

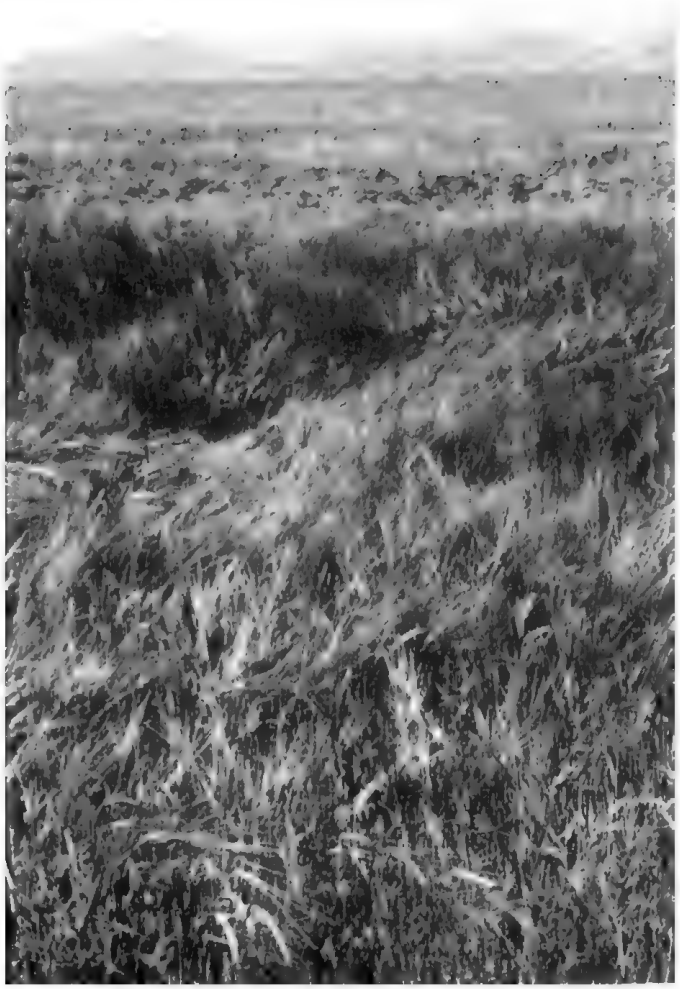


Figure 8.—Barley grown for livestock feed and for malting is a major crop on Norte gravelly sandy loam.

The potential natural vegetation on this soil is dominated by blue grama, Indian ricegrass, western wheatgrass, needleandthread, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and western wheatgrass decreases, and that of blue grama, squirreltail, threeawn, snakeweed, and rabbitbrush increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Establishing rangeland seedlings is difficult because of the low rainfall and the low available water capacity. Deferred grazing, cross fencing, and stockwater developments help to prevent range deterioration and promote the growth of the more desirable plants.

Nonirrigated areas of this soil that are used as range have limited potential for wildlife habitat because of the low vegetative production. These areas support such wildlife as antelope, jackrabbit, cottontail, and coyote, along with various rodents. In irrigated areas, crop residue from alfalfa, barley, and oats can provide food for pheasants and waterfowl.

This soil is suited to homesite development. The main limitation is wetness. Wetness can be reduced by installing drain tile around footings. Sewage lagoons and trench-type sanitary landfills can cause pollution of groundwater. Shoring is commonly needed during excavation to prevent cutbanks from caving. The Norte soil is a fair source of sand and gravel and a good source of roadfill.

This soil is in capability subclasses IIIs, irrigated, and VIIs, nonirrigated. It is in the Mountain Outwash range site.

53—Ouray-Sabe, dry complex, 9 to 25 percent slopes. These soils are on fans at elevations of 7,800 to 8,500 feet. The average annual precipitation is about 14 inches; the average annual air temperature is about 40 degrees F; and the frost-free season is about 90 days.

The Ouray soils make up about 65 percent of the unit, and the Sabe soils make up about 35 percent.

The Ouray soils are deep, excessively drained soils formed in alluvium from sand. Slope ranges from 9 to 15 percent. Typically, the surface layer is grayish brown and brown loamy sand about 13 inches thick. The underlying material to a depth of 60 inches is yellowish brown and pale brown loamy sand.

In the Ouray soils, permeability is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, and the erosion hazard is low to moderate. The soil blowing hazard is high.

The Sabe soils are deep, well drained to somewhat excessively drained soils that formed in alluvium from sand. Slope ranges from 15 to 25 percent.

Typically, the surface layer is very dark grayish brown very stony sandy loam about 7 inches thick. The subsurface layer is pinkish gray very cobbly sandy loam about 8 inches thick. The subsoil is light brown and strong brown very gravelly loamy sand about 33 inches thick. It has sandy clay loam in the lower part. The substratum to a depth of 60 inches or more is yellowish brown sand.

In the Sabe soils, permeability is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate to low. Surface runoff is moderately slow, and the hazard of erosion is moderate.

The soils in this complex are used for summer homesites, recreation areas, and wildlife habitat.

The potential natural vegetation on the Ouray soils is dominated by Scribner needlegrass, Indian ricegrass, and needleandthread. Blue grama, true mountainmahogany, and forbs are prominent but widely spaced. If the range deteriorates, the proportion of more desirable grasses decreases, and that of blue grama, sand dropseed, rabbitbrush, and yucca increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

The Sabe soils are suited to the production of pinyon pine. They are capable of producing about 7 cords per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot. The primary limitations to wood production on both the Ouray and Sabe soils are sandy soils, slope, and the moderate erosion hazard. The sandiness of the soils hinders the use of equipment. Roads and skid trails are difficult to travel unless surfaced. Low available water capacity and low rainfall can influence the rate of seedling survival.

Potential understory vegetation on the Sabe soils is dominated by western wheatgrass, needleandthread, Indian ricegrass, blue grama, and true mountainmahogany. If the stand of pinyon and juniper trees becomes more dense, the understory vegetation becomes more sparse and production is low.

These soils support such wildlife as deer, antelope, jackrabbit, cottontail, coyote, and various rodent species.

Recreation on this unit is mainly hunting, hiking, and sightseeing.

These soils are poorly suited to homesite development. The main limitations are slope and, on the Sabe soils, large stones. Caving of cutbanks is a hazard if these soils are excavated, and precautions such as sloping the cutbanks and shoring of trenches are necessary. These soils are not well suited to sewage lagoons and sanitary landfills because of sandy textures, permeability rates, and slope. Roads and streets commonly require surfacing. Vegetation should be disturbed as little as possible during construction in order to reduce soil blowing.

These soils are in capability subclass VIIs, nonirrigated. Ouray soils are in the Foothill Sand range site, and Sabe soils are in the Pinyon-Juniper Woodland range site.

54—Parlin gravelly loam, 3 to 35 percent slopes. This deep, well drained soil is on mountain side slopes and ridges. Elevation is 8,200 to 9,400 feet. The soil formed in colluvium from rhyolite and rhyolitic tuff. The average annual precipitation is about 15 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 80 days.

Included in this unit are small areas of Hopkins channery loam and Cheadle channery loam. Also included is an area in the northwestern part of the survey area that is made up of dissimilar clay loam soils that are slowly permeable. These soils have rapid runoff, and the hazard of erosion is very high. The area covered by these soils is about 300 acres in the survey area.

Typically, the surface layer of this Parlin soil is brown gravelly loam about 8 inches thick. The subsoil is mainly light brown gravelly clay loam about 12 inches thick. The substratum is light yellowish brown and light brown extremely flaggy clay loam.

Permeability is slow. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the erosion hazard is moderate.

This soil is used as range and wildlife habitat and for recreation.

The potential natural vegetation on this soil is dominated by western wheatgrass, needleandthread, and Arizona fescue, with smaller amounts of Letterman needlegrass, Parry oatgrass, and mountain muhly. If the range deteriorates, the proportion of Arizona fescue decreases, and that of bluegrasses, rabbitbrush, weeds, and woody forbs increases.

Seeding rangeland on this Parlin soil is limited because of steep slopes, soil shallowness, and low rainfall. Deferred grazing, cross fencing, and stockwater developments are generally needed to prevent range deterioration and to permit the growth and increase of more desirable plant species.

This soil supports habitat for such wildlife as bighorn sheep, antelope, cottontail, deer, elk, jackrabbit, and coyote.

Recreation on this unit is mainly hunting, hiking, and sightseeing.

This soil is generally suited to homesite development. The main limitations are slow permeability, shrink-swell potential, large stones, and slope. Steeper areas are poorly suited to homesites. The designs of roads and buildings need to be modified to offset these limitations. Slope is a limitation for septic tank absorption fields, and absorption lines should be installed on the contour. If this soil is used for septic tank absorption fields, the

limitation of moderately slow permeability can be overcome by increasing the size of the absorption field.

This soil is in capability subclass VIIe. It is in the Mountain Loam (10- to 14-inch precipitation zone) range site.

55—Platoro loam, 0 to 3 percent slopes. This deep, well drained soil is on fans and terraces on alluvial valley floors. Elevation is 7,600 to 8,000 feet. The soil formed in alluvium derived mainly from basalt. The average annual precipitation is about 8 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 95 days.

Included in this unit are small areas of Graypoint gravelly sandy loam and Derrick very gravelly loam.

Typically, the surface layer of this Platoro soil is light brownish gray loam about 8 inches thick. The subsoil, about 13 inches thick, is brown clay loam in the upper part and brown gravelly clay loam in the lower part. The upper part of the substratum is light brownish gray very gravelly loam and has visible calcium carbonate. The lower part of the substratum to a depth of 60 inches is light brownish gray very gravelly loamy sand.

Permeability is moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight. Soil blowing is a hazard if plant residue is removed.

This soil is used for irrigated cropland, irrigated pasture, and range. Crops commonly grown are alfalfa, potatoes, and small grains. Applications of commercial fertilizers, manure, and plant residue are commonly needed. Generally, all crops except legumes respond to applications of nitrogen fertilizer, and all legumes respond to applications of phosphate fertilizer.

Irrigation methods suitable for this soil are the border, furrow, and sprinkler methods. Sprinkler irrigation is suited to most crops. The furrow method is suited to row crops. Border irrigation is suited to alfalfa, small grains, and pasture. Land leveling and proper length of run are needed to prevent water loss from seepage and the buildup of salts in the soil. Use of minimum tillage practices and high-residue crops helps prevent soil blowing.

The potential natural vegetation on this soil is dominated by blue grama, Indian ricegrass, western wheatgrass, needleandthread, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and western wheatgrass decreases, and that of blue grama, threeawn, snakeweed, and rabbitbrush increases. Undesirable weeds invade and become more abundant as the range condition declines.

Establishing rangeland seedlings is difficult on this soil because of the low rainfall and the moderate available water capacity. Deferred grazing, cross fencing, and stockwater developments help to prevent range deterioration and to promote the growth of more desirable plants.

Wildlife habitat is an important secondary use of this Platoro soil. The soil is best suited to habitat for such wildlife as ring-necked pheasant, mourning dove, and many nongame species in cropland areas. Favorable habitats can be developed by establishing areas for nesting and escape cover. For pheasants, undisturbed nesting cover is vital and should be included in plans for habitat development. Populations of wildlife, such as pronghorn antelope, can be increased by livestock water development and proper grazing management.

This soil is suited to homesite development. The main limitation is shrink-swell potential. Shoring is needed to prevent deep cutbanks from caving. Maintaining a constant moisture content around foundations or backfilling with material that has low shrink-swell potential can reduce the effects of shrinking and swelling. Sewage lagoons or trench-type sanitary landfills may cause pollution of underground water.

This soil is in capability subclasses IIIe, irrigated, and VIIs, nonirrigated. It is in the Mountain Outwash range site.

56—Platoro cobbly loam, 3 to 9 percent slopes. This deep, well drained soil is on fans and terraces on alluvial valley floors. Elevation is 7,600 to 8,000 feet. The soil formed in alluvium derived mainly from basalt. The average annual precipitation is about 8 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 95 days.

Included in this unit are small areas of Graypoint gravelly sandy loam and Derrick very gravelly loam.

Typically, the surface layer of this Platoro soil is light brownish gray cobbly loam about 8 inches thick. The subsoil is brown gravelly clay loam about 25 inches thick. The substratum to a depth of 60 inches is light brownish gray very gravelly loamy sand.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

This soil is used as range and wildlife habitat.

The potential natural vegetation on this Platoro soil is dominated by blue grama, Indian ricegrass, western wheatgrass, needleandthread, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and western wheatgrass decreases, and that of blue grama, threeawn, snakeweed, and rabbitbrush increases. Undesirable weeds invade and become more abundant as range condition declines.

Establishing rangeland seedlings is difficult on this soil because of the low rainfall. Deferred grazing, cross fencing, and stockwater developments help to prevent range deterioration and to promote the growth of the more desirable plants.

Wildlife habitat is also an important use of this soil. The habitat supported by this soil is best suited to cottontail, jackrabbit, and coyote. Populations of such wildlife as pronghorn antelope can be increased by livestock water development and proper grazing.

This soil is suited to homesite development. The main limitation is shrinking and swelling of the soil. Shoring is needed to prevent deep cutbanks from caving. Maintaining a constant amount of moisture around foundations or backfilling with material that has low shrink-swell potential can reduce the effects of shrinking and swelling. Sewage lagoons and trench type sanitary landfills may cause pollution of ground water.

This soil is in capability subclass VIIe, nonirrigated. It is in the Mountain Outwash range site.

57—Rock outcrop, steep. This unit consists of about 90 percent bedrock outcrops and 10 percent shallow and very shallow soils. The most important soil characteristics are shallowness and stoniness. The exposed bedrock consists of granite, schist, basalt, tuff, rhyolite, andesite, and breccia. Slope ranges from about 30 to 100 percent.

Effective rooting depth is limited by depth to bedrock in the areas where soil is present. Available water capacity is very low. Surface runoff is rapid, and the erosion hazard is moderate.

The soils in this unit are used for watershed, wildlife habitat, limited grazing, and recreation. Plant cover is sparse and consists mainly of blue grama, mountain muhly, Indian ricegrass, snowberry, and other shrubs that have shallow roots.

Rock outcrop is poorly suited to homesite development. Access is limited by the topography.

This miscellaneous area is in capability subclass VIII.

58—Rock River gravelly loam, 3 to 15 percent slopes. This deep, well drained soil is on valley side slopes and fans. Elevation is 7,800 to 8,400 feet. The soil formed in calcareous alluvium. The average annual precipitation is about 10 inches; the average annual air temperature is about 41 degrees F; and the frost-free season is about 95 days.

Included in this unit are small areas of Graypoint gravelly sandy loam, Jodero loam, Lolo gravelly sandy loam, Luhon loam, and Platoro loam.

Typically, the surface layer of this Rock River soil is yellowish brown gravelly loam about 6 inches thick. The subsoil is brown, yellowish brown, and light brown gravelly sandy clay loam about 24 inches thick. The substratum to a depth of 60 inches is calcareous, brown gravelly loam that overlies gravelly sandy loam.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

This Rock River soil is used for range. The potential rangeland vegetation is dominated by blue grama, Indian ricegrass, western wheatgrass, needleandthread, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and western wheatgrass decreases, and that of blue grama, threeawn, snakeweed, and rabbitbrush increases. Undesirable weeds invade and become more abundant as range condition declines.

Establishing rangeland seedlings is possible on this soil. Adapted species are Russian wildrye, Nordan crested wheatgrass, Siberian wheatgrass, and pubescent wheatgrass. Plowing or disking and drilling should be done on the contour or across the slope to minimize runoff and soil losses before the grasses become established. Late summer seedings have proven most successful. Deferred grazing, cross fencing, stockwater developments, brush control, and erosion control structures are generally needed to help prevent range deterioration and to promote the growth of more desirable plant species.

This soil supports habitat for such wildlife as antelope, cottontail, coyote, and jackrabbit. Forage production is commonly low, and livestock grazing management practices are needed if wildlife and livestock share the range. Livestock watering developments are important to wildlife and are used by various wildlife species.

This soil is suited to homesite development. The main limitation is slope. Plant cover should be disturbed as little as possible during construction to keep soil loss at a minimum.

This soil is in capability subclass VIIe, nonirrigated. It is in the Mountain Outwash range site.

59—Rock River gravelly loam, 15 to 25 percent slopes. This deep, well drained soil is on fans and valley side slopes. Elevation is 7,800 to 8,400 feet. The soil formed in calcareous alluvium. The average annual precipitation is 10 inches; the average annual air temperature is about 41 degrees F; and the frost-free season is about 95 days.

Included in this map unit are small areas of Luhon loam, Platoro loam, and Jodero loam.

Typically, the surface layer is yellowish brown gravelly loam about 6 inches thick. The subsoil is brown gravelly sandy clay loam about 24 inches thick. The substratum to a depth of 60 inches is brown, calcareous gravelly loam that overlies gravelly sandy loam.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

This Rock River soil is used as range.

The potential natural vegetation is dominated by blue grama, western wheatgrass, needleandthread, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and

western wheatgrass decreases, and that of blue grama, threeawn, snakeweed, and rubber rabbitbrush increases. Undesirable weeds invade and become more abundant as the range condition declines.

Establishing rangeland seedlings is possible on this soil. Adapted species are Russian wildrye, Nordan crested wheatgrass, Siberian wheatgrass, and pubescent wheatgrass. Seedbed preparation should be done on the contour or across the slope to minimize runoff and soil losses before the grasses become established. Late summer seedings have proven most successful. Deferred grazing, cross fencing, stockwater developments, brush control, and erosion control structures are generally needed to help prevent range deterioration and to promote the growth of more desirable plant species.

This soil supports habitat for such wildlife as antelope, cottontail, coyote, and jackrabbit. Forage production is commonly low, and livestock grazing management practices are needed if wildlife and livestock share the range. Livestock watering developments are important to wildlife and are used by various wildlife species.

This soil is poorly suited to homesite development. The main limitation is slope.

This soil is in capability subclass VIIe. It is in the Mountain Outwash range site.

60—Saguache gravelly sandy loam, 0 to 1 percent slopes. This deep, well drained soil is on flood plains and terraces on alluvial valley floors. Elevation is 7,600 to 8,000 feet. The soil formed in alluvium. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 95 days.

Included in this unit are small areas of Dunul cobbly sandy loam, Norte gravelly sandy loam, and Gunbarrel loamy sand.

Typically, the surface layer of this Saguache soil is light brownish gray gravelly sandy loam 8 inches thick. The next layer is light yellowish brown gravelly loamy sand about 8 inches thick. The underlying material to a depth of 60 inches is pale brown very gravelly sand.

Permeability is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, and the hazard of erosion is slight. Soil blowing is a hazard if plant residue is removed.

This Saguache soil is used for irrigated cropland and range. Small grains and alfalfa are the crops normally grown. Applications of commercial fertilizer, manure, and plant residue are needed.

Border and sprinkler irrigation are suitable for this soil. Sprinkler irrigation is well suited to all crops that can be grown on this soil. Border irrigation is suited to alfalfa, small grains, and irrigated pasture if short lengths of run are used. Land leveling is generally necessary for border irrigation. Water loss and salt buildup in the surface layer of the soil can be prevented by using irrigation water management practices. Use of minimum tillage practices and high-residue crops helps prevent soil blowing.

The potential natural vegetation on this soil is dominated by blue grama, Indian ricegrass, western wheatgrass, needleandthread, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and western wheatgrass decreases, and that of blue grama, threeawn, snakeweed, and rabbitbrush increases. Undesirable weeds invade and become more abundant as the range condition declines.

Establishing rangeland seedlings is difficult on this Saguache soil because of the low rainfall. Deferred grazing, cross fencing, and stockwater developments help to prevent range deterioration and promote the growth of more desirable plant species.

This soil is not very productive for wildlife habitat if it is not irrigated. Nonirrigated areas of this soil support such species as antelope, jackrabbit, cottontail, coyote, and various rodents. If the soil is irrigated, crop residue from alfalfa, barley, and oats can be used by pheasants and waterfowl.

This soil is well suited to homesite development. Sewage lagoons and trench-type sanitary landfills can cause pollution of ground water. Caving of cutbanks is a problem if this soil is excavated. This soil is a fair source of sand and a good source of gravel and roadfill.

This soil is in capability subclasses IVs, irrigated, and VIIs, nonirrigated. It is in the Mountain Outwash range site.

61—Saguache gravelly sandy loam, 3 to 9 percent slopes. This deep, well drained soil is on flood plains, fans, and terraces on alluvial valley floors. Elevation is 7,600 to 8,000 feet. The soil formed in alluvium. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 95 days.

Included in this unit are small areas of Dunul cobbly sandy loam, Mount Home cobbly sandy loam, and Norte gravelly sandy loam.

Typically, the surface layer of this Saguache soil is a light brownish gray gravelly sandy loam 8 inches thick. The next layer is light yellowish brown gravelly loamy sand 8 inches thick. The underlying material to a depth of 60 inches is pale brown very gravelly sand.

Permeability is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, and the soil blowing hazard is moderate.

This soil is used as range.

The potential natural vegetation on this Saguache soil is dominated by blue grama, Indian ricegrass, western wheatgrass, needleandthread, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and western wheatgrass decreases, and that of blue grama,

threeawn, snakeweed, and rabbitbrush increases. Undesirable weeds invade and become more abundant as the range condition declines.

Deferred grazing, cross fencing, and stockwater developments help to prevent range deterioration and promote the growth of the more desirable plant species.

This soil has limited potential for wildlife habitat because of low vegetative production. The soil supports such wildlife as antelope, jackrabbit, cottontail, and coyote, along with various rodent species.

This soil is well suited to homesite development. In places, excavation for houses and access roads exposes material that is highly susceptible to soil blowing. Sewage lagoons and trench-type sanitary landfills can cause pollution of ground water. Caving of cutbanks is a problem if this soil is excavated. This soil is a fair source of sand and a good source of gravel and roadfill.

This soil is in capability subclass VIIs. It is in the Mountain Outwash range site.

62—San Arcacio sandy loam. This deep, well drained soil is on terraces on alluvial valley floors. Elevation is 7,600 to 7,900 feet. The soil formed in alluvium underlain by sand and gravel. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 95 days.

Included in this unit are small areas of Dunul very gravelly sandy loam, Norte gravelly sandy loam, and Saguache gravelly loam.

Typically, the surface layer of this San Arcacio soil is pale brown sandy loam 5 inches thick. The upper part of the subsoil is pale brown and light sandy clay loam 6 inches thick. The lower part of the subsoil is brown sandy clay loam about 8 inches thick. The substratum to a depth of 60 inches is brown sandy loam in the upper 6 inches and is very gravelly sand in the lower part.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight. An irrigation-induced high water table is within 3 to 4 feet of the surface during the summer months. Soil blowing is a hazard if plant residue is removed.

This soil is used for irrigated potatoes, alfalfa, and small grains and for range. Commercial fertilizers, crop residue, and manure are generally needed. Generally, small grains and potatoes respond to applications of nitrogen and phosphate fertilizers, and alfalfa responds to phosphate fertilizers.

Border and sprinkler irrigation methods are suitable for this soil. Sprinkler irrigation is well suited to most crops. Border systems that have short lengths of run are suited to alfalfa, small grains, and pasture. Land leveling and proper length of run are needed to prevent water loss from seepage and the buildup of salts in the soil. Use of minimum tillage practices and high-residue crops helps prevent soil blowing.

The potential natural vegetation on this San Arcacio soil is dominated by alkali sacaton, alkali cordgrass, and greasewood. Rubber rabbitbrush, inland saltgrass, and western wheatgrass are prominent but widely spaced. If the range deteriorates, the proportion of the more desirable grasses, such as alkali sacaton and western wheatgrass, decreases, and that of greasewood, rabbitbrush, and saltgrass increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Establishing rangeland seedlings is difficult on this soil because of the low rainfall. Irrigation is necessary to leach salts from the surface and for seedling development. Deferred grazing, cross fencing, stockwater developments, and brush control help to prevent range deterioration and promote the growth of more desirable plant species.

This soil has limited potential for wildlife habitat because of low vegetative production. In nonirrigated areas, the habitat is best for such wildlife as jackrabbit, cottontail, and coyote. If wildlife use is contemplated, livestock grazing management practices are necessary. In irrigated areas of this soil, crop residue from oats and barley can provide food for ring-necked pheasant and waterfowl.

This soil is suited to homesite development. The main limitations are wetness, shrink-swell potential, seepage, and salt content. Soil blowing is a hazard wherever vegetation is disturbed. Septic tank absorption fields and trench-type sanitary landfills can cause pollution of ground water unless drainage systems are developed. Maintaining a constant moisture content around foundations or backfilling with material that has a low shrink-swell potential can offset the shrink-swell potential of the soil.

This soil is in capability subclasses IIIs, irrigated, and VIIs, nonirrigated. It is in the Salt Flats range site.

63—San Luis sandy loam. This deep, nearly level, somewhat poorly drained, salt- and alkali-affected soil is on fans and flood plains on alluvial valley floors. The soil formed in alluvium derived mainly from basalt. Elevation is 7,600 to 8,000 feet. The average annual precipitation is about 8 inches; the average annual air temperature is about 41 degrees F; and the frost-free season is about 95 days.

Included in this unit are a few small areas of McGinty sandy loam, Gunbarrel loamy sand, Hooper clay loam, and Mosca loamy sand.

Typically, the surface layer of this San Luis soil is pale brown sandy loam about 10 inches thick. The subsurface layer is light gray light sandy clay loam about 5 inches thick. The upper part of the subsoil is pale brown light clay loam about 9 inches thick. The lower part of the subsoil is pale brown sandy clay loam 8 inches thick. The substratum to a depth of more than 60 inches is

light brownish gray. It is light sandy clay loam in the upper 5 inches and very gravelly sand below.

Permeability is moderately slow. Effective rooting depth is 60 inches or more except in areas limited by the high water table. Available water capacity is moderate. Surface runoff is slow, the hazard of erosion is slight, and the hazard of soil blowing is moderate if plant residue is removed. A high water table is within 2 feet of the surface during the irrigation season.

This soil is used mainly as native range. Where drainage is established, irrigated pasture, alfalfa, barley potatoes, and oats can be grown after salts have been leached from the root zone.

The potential natural vegetation on this San Luis soil is dominated by alkali sacaton, alkali cordgrass, and greasewood. Rubber rabbitbrush, inland saltgrass, and western wheatgrass are prominent but widely spaced. If the range condition deteriorates, the proportion of more desirable grasses, such as alkali sacaton and western wheatgrass, decreases, and that of greasewood, rabbitbrush, and saltgrass increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Establishing rangeland seedling is difficult on this soil because of the low rainfall. Irrigation is needed to leach salts from the surface and for seedling development. Deferred grazing, cross fencing, stockwater developments, and brush control can help prevent range deterioration and promote the growth of more desirable plant species.

Border and sprinkler methods of irrigation are suited to this soil. If border systems are used, land leveling is necessary for proper irrigation water management. Heavy applications of gypsum or sulfuric acid, along with commercial fertilizers, manure, and crop residue are needed. Gypsum or sulfuric acid helps to leach salts and alkali from the plant rooting zone. Soil drainage is needed to promote good yields and to prevent buildup of salts. Regardless of the irrigation method used, adjusted length of run and proper timing are needed to keep water loss to a minimum and prevent salt buildup. Minimum tillage practices and maintenance of crop residue on the soil surface are needed to protect against soil blowing.

Generally, all crops except legumes respond to applications of nitrogen fertilizers, and legumes respond to applications of phosphate fertilizer.

This soil supports habitat for such wildlife as jackrabbit, cottontail, and coyote. Proper livestock grazing management and water development may increase wildlife populations. Pheasant, mourning dove, and other birds may inhabit the irrigated cropland.

This soil is poorly suited to homesite development. The main limitations are shrink-swell potential, frost action, excess alkali, and wetness. Selection of alkali-tolerant vegetation is critical for the establishment of lawns, shrubs, and trees. Designs of dwellings and roads can be modified to offset the main limitations. Soil drainage minimizes frost heave. Outlets can be difficult to obtain. Community sewage systems are needed to prevent the contamination of water supplies as a result of seepage.

This soil is in capability subclasses IVsw, irrigated, and VIIw, nonirrigated. It is in the Salt Flats range site.

64—San Luis sandy loam, drained. This deep, nearly level, moderately well drained soil is on fans and flood plains on alluvial valley floors. It developed in alluvium derived mainly from basalt. Elevation is 7,600 to 8,000 feet. The average annual precipitation is about 8 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 95 days.

Included in this unit are a few small areas of McGinty sandy loam, Gunbarrel loamy sand, Hooper clay loam, and Mosca loamy sand.

Typically, the surface layer of this San Luis soil is pale brown sandy loam about 10 inches thick. The subsurface layer is light gray sandy clay loam about 5 inches thick. The subsoil, about 17 inches thick, is pale brown light clay loam that is faintly mottled. The substratum to a depth of more than 60 inches is light brownish gray. It is light sandy clay loam in the upper 5 inches and very gravelly sand below.

Permeability is moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, the hazard of erosion is slight, and the hazard of soil blowing is moderate if plant residue is removed. A high water table is at a depth of 2.0 to 3.5 feet during the irrigation season.

This soil is used mainly for irrigated hay, pasture, alfalfa, barley, and potatoes. Maintenance of a drainage system is necessary to prevent salt buildup in the root zone of plants.

Border and sprinkler methods of irrigation are suited to this soil. Applications of commercial fertilizer, gypsum, crop residue, and manure are needed. Gypsum helps leach alkali from the soil profile. Generally, small grains and potatoes respond to nitrogen and phosphate fertilizers. Alfalfa responds to phosphate fertilizer. The furrow method of irrigation is well suited to row crops, and sprinkler irrigation is suited to most crops. Regardless of the irrigation method used, land leveling, adjusted length of run, and timing are needed to keep water loss to a minimum and to help prevent the buildup of salts. Using minimum tillage practices and maintaining crop residue on the soil surface help to protect the soil from blowing and to keep soil losses to a minimum.

The potential natural vegetation on this San Luis soil is dominated by alkali sacaton, alkali cordgrass, and greasewood. Rubber rabbitbrush, inland saltgrass, and western wheatgrass are prominent but widely spaced. If the range condition deteriorates, the proportion of the more desirable grasses, such as alkali sacaton and western wheatgrass, decreases, and that of greasewood,

rabbitbrush, and saltgrass increases. Undesirable weeds and annual plants invade and become more abundant as range condition declines.

Using this soil as range limits its potential for wildlife habitat. Jackrabbit, cottontail, and coyote are adapted to rangeland. In irrigated areas, crop residue from oats and barley can provide food for ring-necked pheasant and waterfowl.

This soil is poorly suited to homesite development. The main limitations are a hazard of frost-action, shrink-swell potential, and wetness. Selection of alkali-tolerant vegetation is critical for the establishment of lawns, shrubs, and trees. Designs of roads and buildings need to be modified to offset the limitations of this soil. Septic tank systems and trench-type sanitary landfills can cause pollution of ground water.

This soil is in capability subclass IVs, irrigated, and VIIs, nonirrigated. It is in the Salt Flats range site.

65—Schrader sandy loam, 0 to 3 percent slopes. This deep, poorly drained soil is on flood plains and terraces on alluvial valley floors. Elevation is 7,600 to 8,100 feet. The soil formed in stratified alluvium. The average annual precipitation is about 8 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 95 days.

Included in this unit are small areas of Gerrard loam and Shawa loam.

Typically, the surface layer of this Schrader soil is brown sandy loam 4 inches thick. The next layer is dark grayish brown fine sandy loam about 4 inches thick. The upper part of the underlying material, about 38 inches thick, is dark grayish brown fine sandy loam. The lower part to a depth of 60 inches is mottled, stratified gravelly sandy loam, loamy sand, and sand.

Permeability is moderately rapid. Effective rooting depth is about 30 inches. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight. Schrader soils have a high water table within 1 foot to 2 feet of the surface during the irrigation season. Frequent flooding can occur during periods of snowmelt when streamflow is high.

This soil is used for irrigated pasture and hayland, irrigated small grains, and range. Sprinkler, border, and furrow irrigation are suited to this soil. Land leveling and applications of commercial fertilizers, manure, and plant residue are needed for good yields of irrigated crops. Generally, all crops except legumes respond to nitrogen fertilizers, and legumes respond to phosphate fertilizer. Drainage is needed to promote good yields and to prevent the buildup of salts in the surface layer. Protection from flooding is needed to prevent soil loss and damage to crops. Maintaining crop residue on the soil surface helps to protect the soil from the hazard of blowing and keeps soil losses to a minimum.

The potential natural vegetation on this Schrader soil is dominated by western and slender wheatgrasses on the drier parts, and by tufted hairgrass, bluejoint, reedgrass, and Nebraska sedge on the wet areas. If the range deteriorates, the proportion of these more desirable plants decreases, and that of less desirable plants such as foxtail barley, Baltic rush, forbs, and woody shrubs increases. Undesirable weeds and annuals invade and become more abundant as the range condition declines.

Establishing rangeland seedlings on this soil is difficult because of wetness. Renovating, deferred grazing, cross fencing, and brush control help prevent range deterioration and promote the growth and increase of more desirable plant species.

Wildlife such as deer and cottontail use these areas, where excellent cover is provided by willows and other plants (fig. 9). Wildlife populations can be increased by livestock grazing practices that allow natural vegetation, such as willows and cattails, to develop.

This soil is poorly suited to homesite development. The main limitations are frequent flooding, wetness, and frost action. Protection from flooding, soil drainage, and modification of the designs of roads and buildings are necessary to offset these limitations. Because of wetness in this soil, septic tank systems do not function properly and can cause pollution of ground water.

This soil is in capability subclasses IIIw, irrigated, and Vw, nonirrigated. It is in the Wet Meadow range site.

66—Seitz very stony loam, 15 to 65 percent slopes. This deep, well drained soil is on mountainsides and ridges. The soil developed in colluvium derived from igneous rocks. Elevation is 9,800 to 11,500 feet. The average annual precipitation is about 20 inches; the average annual air temperature is about 34 degrees F; and the frost-free period lasts from about 30 to 50 days.

Included in this unit are small areas of Bushvalley cobbly loam and Rock outcrop.

Typically, this Seitz soil has a thin organic layer of partly decomposed needles and twigs on the surface. The subsurface layer is pale brown very stony loam about 4 inches thick. The subsoil is brown and yellowish brown very stony clay loam. The substratum to a depth of 60 inches is yellowish brown extremely stony clay loam.

Permeability is slow. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is rapid, and the hazard of erosion is very high.

This soil is used for woodland and wildlife habitat.

The potential natural plant community on this Seitz soil is mainly Engelmann spruce and an understory of Thurber fescue, Parry oatgrass, nodding brome, and slender wheatgrass. This Seitz soil is suited to the production of Engelmann spruce. The potential production per acre of timber is 3,500 cubic feet or 20,000 board feet from a fully stocked, even-aged stand of 80-year-old trees. The primary restrictions on the use

Figure 9.—Areas of Schrader sandy loam, 0 to 3 percent slopes, near Crestone provide food and cover for deer and other wildlife.

of this soil for timber production are stones in the surface layer. These stones influence falling, yarding, and other operations involving the use of equipment. Conventional harvesting methods generally are restricted to areas in which slope is less than 40 percent. Access to the steeper areas is limited. Special attention must be given to keeping soil erosion to a minimum during harvest. Grazing in harvested areas should be deferred for at least 2 years to assure the development of sufficient plant cover to protect the soil from erosion. The moderate available water capacity of the soil may influence the rate of seedling survival.

This soil supports habitat for such wildlife as blue grouse, snowshoe hare, and black bear. It also furnishes food and cover for deer and elk. Wildlife productivity can be increased by cutting openings in the Engelmann spruce and alpine fir to remove overstory competition, thus increasing productivity of grasses, shrubs, and forbs grazed by deer and elk.

This soil is poorly suited to homesite development. The main limitations are large stones and steep slopes. Use of heavy equipment and careful selection of building sites are necessary. Plant cover on construction sites should be disturbed as little as possible, and special measures are needed to help prevent erosion.

This soil is in capability subclass VIIs. It is in the Engelmann Spruce-Subalpine Fir Woodland range site.

67—Seitz very stony loam, warm, 15 to 65 percent slopes. This deep, well drained soil is on mountainsides and ridges. It developed in colluvium derived from igneous rock. Elevation is 9,000 to 9,800 feet. The average annual precipitation is about 17 inches; the average annual air temperature is about 34 degrees F; and the frost-free period is about 60 days.

Included in this unit are a few small areas of Bushvalley cobbly loam, Comodore very stony loam, and Rock outcrop.

Typically, this Seitz soil has a thin organic layer of partly decomposed needles and twigs over a dark grayish brown very stony loam surface layer about 4 inches thick. The subsurface layer

is pale brown very stony loam about 8 inches thick. The subsoil is brown and yellowish brown very stony heavy clay loam about 16 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely stony clay loam.

Permeability is slow. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is moderate, and the hazard of erosion is moderate to very high.

The Seitz soil is primarily used for woodland and wildlife habitat.

The potential natural plant community on this soil is mainly ponderosa pine and Douglas-fir, with an understory of Thurber fescue, Parry oatgrass, nodding brome, and slender wheatgrass. Woody shrubs, forbs, and weeds are also present. If the range condition deteriorates, the proportion of desirable grasses decreases, and that of less desirable grasses, shrubs, and forbs increases.

This soil is suited to the production of ponderosa pine. Based on a site index of 55, the potential production per acre of timber is 1,200 cubic feet or 2,950 board feet. Limitations to the use of this soil for timber production are stones and steep slopes. Conventional harvesting methods generally are restricted to areas that have slope of less than 40 percent. Stones and slopes influence harvesting and the use of equipment. Conservation practices are needed to keep soil erosion to a minimum on skid trails and logging roads. Grazing in harvested areas should be deferred for at least 2 years to assure the development of sufficient plant cover to protect the soil from erosion.

This soil supports habitat for such wildlife as blue grouse, snowshoe hare, mule deer, elk, and black bear. Wildlife productivity may be increased through proper grazing practices and well managed timber harvesting. The latter increases the proportion of grasses, forbs, and shrubs which are used by deer, elk, and other wildlife.

This soil is poorly suited to homesite development. The main limitations are large stones and steep slopes. Use of heavy equipment and careful selection of building and road sites are necessary. Maintaining plant cover on the soil helps to prevent erosion and keeps soil loss to a minimum.

This soil is in capability subclass VIIs. It is in the Ponderosa Pine-Douglas Fir Woodland range site.

68—Sessions loam, 9 to 35 percent slopes. This deep, well drained soil is on fans and foot slopes. Elevation is 8,500 to 9,000 feet. The soil formed in alluvium derived from igneous rocks. The average annual precipitation is about 18 inches; the average annual air temperature is about 40 degrees F; and the average frost-free period is about 75 days.

Included in this unit are small areas of similar soils that are about 40 inches thick over a gravelly substratum and areas of Bushvalley cobbly loam and Gelkie loam.

Typically, the surface layer is dark gray loam about 14 inches thick. The subsoil is brown gravelly clay about 37 inches thick. The substratum to a depth of 60 inches is light brown gravelly clay loam.

Permeability is slow. Effective rooting depth is 60 inches or more. Available water capacity is moderately high. Surface runoff is moderately rapid, and the hazard of erosion is moderate.

This soil is used as native range and wildlife habitat.

The potential natural vegetation on this Sessions soil is dominated by Arizona fescue, mountain muhly, Parry oatgrass, and bearded wheatgrass. Big sagebrush, rabbitbrush, and cinquefoil are prominent but widely spaced. If the range deteriorates, the proportion of more desirable grasses, such as Arizona fescue and wheatgrasses, decreases, and that of sagebrush and rabbitbrush increases. Undesirable weeds and brush plants invade and become more abundant as the range condition declines.

Deferred grazing, cross fencing, stockwater developments, and brush control help prevent range deterioration and promote the growth and increase of more desirable plant species.

Such wildlife as antelope, coyote, and jackrabbit are best adapted to the habitat this soil supports. Deer and elk use areas of this soil as winter range.

This soil is poorly suited to homesite development. The main limitations are slope, shrink-swell potential, and slow permeability. Buildings and roads should be designed to offset the effects of slope and the shrinking and swelling. Septic tank absorption fields do not operate properly on this soil because of the slow permeability.

This soil is in capability subclass VIe, nonirrigated. It is in the Mountain Loam range site.

69—Shawa loam, 0 to 4 percent slopes. This deep, moderately well drained soil is on fans and low terraces adjacent to streams on alluvial valley floors. Elevation is 7,600 to 8,400 feet. The soil formed in alluvium. The average annual precipitation is about 12 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 95 days.

Included in this unit are small areas of Schrader sandy loam, Gerrard loam, and Dunul gravelly sandy loam.

Typically, the surface layer of this Shawa soil is dark grayish brown and very dark grayish brown loam in about the upper 13 inches. The lower part of the surface layer is very dark gray clay loam 23 inches thick. The next layer is dark grayish brown clay loam about 17 inches thick. The underlying material to a depth of 60 inches is a gray loam.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is moderate, and the hazard of erosion is slight. In some profiles, a seasonal high water table is within a

depth of 4 to 6 feet during the irrigation season. Soil blowing is a hazard if plant residue is removed.

This Shawa soil is used for irrigated pasture, range, and irrigated crops of potatoes, small grains, and alfalfa. Commercial fertilizer, manure, and plant residue are commonly needed. Generally, all crops except legumes respond to nitrogen fertilizer, and legumes respond to phosphate fertilizer. Drainage systems help prevent waterlogging and the buildup of salts.

Border, furrow, and sprinkler irrigation methods are suitable for this soil. Sprinkler irrigation is well suited to most crops. The furrow method is suited to row crops, and borders are suited to alfalfa, small grains, and pasture. Land leveling is generally needed for border and furrow irrigation, and lengths of run need to be adjusted to prevent water loss and soil erosion. Use of minimum tillage practices and high-residue crops helps prevent soil blowing.

The potential natural vegetation on this Shawa soil is dominated by western and slender wheatgrass, needleandthread, and fourwing saltbush. If the range deteriorates, the proportion of these more desirable plants decreases, and that of blue grama, rubber rabbitbrush, and other less desirable forbs, grasses, and shrubs increases. Undesirable shrubs, weeds, and annual plants invade and become more abundant as the range condition declines.

Seeding rangeland is a suitable practice on this soil, but soil blowing can be a hazard if the surface is left without residue cover during the spring. Adapted species are Nordan crested wheatgrass, Siberian wheatgrass, pubescent wheatgrass, western wheatgrass, and Russian wildrye. Plowing or disking and drilling should be done on the contour or across the slope to minimize runoff and soil losses before the grasses become established. Seeding in conjunction with pitting is also advisable. Late summer seeding has proven most successful. Deferred grazing, cross fencing, and stockwater developments are generally needed to prevent range deterioration and to promote the growth and increase of more desirable plant species.

Wildlife habitat is an important secondary use of this soil. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing wildlife areas for nesting and escape cover. For pheasants, undisturbed nesting cover is vital and should be considered in plans for habitat development. This is especially true in areas of intensive agriculture. Populations of such wildlife as pronghorn antelope can be increased by the development of livestock watering facilities and livestock grazing management practices.

This soil is suited to homesite development. The main limitations are wetness and shrink-swell potential. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems. Drainage may be needed to overcome the wetness. Buildings and roads should be designed to offset the shrinking and swelling.

This soil is in capability subclasses IIIe, irrigated, and VIe, nonirrigated. It is in the Foothill Loam range site.

70—Space City loamy sand, 0 to 6 percent slopes. This deep, somewhat excessively drained soil is along margins of intermountain valleys and basins on alluvial valley floors. Elevation is 7,600 to 8,000 feet. Space City soils formed in eolian sand. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the frost-free season is about 95 days.

Included in this unit are small areas of Dune land, Cotopaxi sand, and Corlett sand.

Typically, the surface layer of this Space City soil is grayish brown and brown loamy sand about 8 inches thick. The underlying material to a depth of 60 inches is brown and light brownish gray loamy sand. It is calcareous below a depth of 18 inches.

Permeability is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, and the hazard of soil blowing is high.

This soil is used as range.

The potential natural vegetation is dominated by Indian ricegrass, needleandthread, spike dropseed, thickspike wheatgrass, and small amounts of blue grama, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and thickspike wheatgrass decreases, and that of blue grama, sand dropseed, threeawn, pricklypear, forbs, and woody shrubs increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Seeding rangeland is difficult on this soil because of the low rainfall and low available water capacity. Deferred grazing, cross fencing, stockwater developments, and brush control are generally needed to prevent range deterioration and to promote the growth and increase of more desirable plant species.

Such wildlife as antelope, cottontail, coyote, and jackrabbit are best adapted to the habitat on this droughty soil. Forage production is typically low, and livestock grazing management practices are needed if wildlife and livestock share the range. Livestock watering developments are also important to various wildlife species.

This soil is well suited to homesite development. Precautions are needed to prevent caving if areas of this soil are excavated. Plant cover should be disturbed as little as possible during construction to minimize soil loss. Use of fertilizer and sprinkler irrigation is necessary to establish plantings on this soil. Sewage lagoons and trench-type sanitary landfills can pollute ground water, because of the soil's rapid permeability. Ponds and

reservoirs built on this soil need to be sealed with clay or other material to prevent seepage and water loss.

This soil is in capability subclasses IVe, irrigated, and VIIe, nonirrigated. It is in the Sandy Bench range site.

71—Space City loamy sand, saline, 0 to 3 percent slopes. This deep, well drained soil is along the margin of intermountain valleys and basins and on alluvial valley floors that have gently undulating topography. Elevation is 7,600 to 8,000 feet. Space City soils formed in eolian sand. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the frost-free season is about 95 days.

Included in this unit are small areas of Laney loam, Mosca sandy loam, and Medano-Hapney complex.

Typically, the surface layer of this Space City soil is grayish brown loamy sand about 8 inches thick. The underlying material to a depth of 60 inches is light brownish gray loamy sand. It is calcareous below a depth of 18 inches.

Permeability is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, and the soil blowing hazard is high.

This soil is used as range.

The potential natural vegetation on this soil is dominated by Indian ricegrass, blue grama, thickspike wheatgrass, and alkali sacaton. Common shrubs are fourwing saltbush, black greasewood, and rubber rabbitbrush. If the range deteriorates, the proportion of Indian ricegrass, thickspike wheatgrass, and alkali sacaton decreases, and that of inland saltgrass, forbs, and woody shrubs increases. Black greasewood and rubber rabbitbrush increase, and annual weeds invade and become more abundant as the range condition declines.

Establishing rangeland seedlings is difficult on this soil because of the low rainfall, uneven topography, and droughty soil conditions. Deferred grazing, cross fencing, stockwater developments, and brush control are generally needed to prevent range deterioration and to promote the growth and increase of more desirable plant species.

Such wildlife as antelope, cottontail, coyote, and jackrabbit, are best adapted to life on this droughty soil. Forage production is typically low, and livestock grazing management practices are needed if wildlife and livestock share the range. Livestock watering developments are also important to various wildlife species.

This soil is well suited to homesite development. Precautions are needed to prevent caving if these soils are excavated. To minimize soil loss, plant cover should be disturbed as little as possible during construction. Use of fertilizer and sprinkler irrigation is necessary to establish plantings on the soil. Sewage lagoons and trench-type sanitary landfills can pollute ground water because of the rapid permeability of the soil. Ponds and reservoirs built on this soil need to be sealed by clay or other material to prevent seepage and water loss.

This soil is in capability subclasses IVe, irrigated, and VIIe, nonirrigated. It is in the Valley Sand range site.

72—Space City-Hooper complex, 0 to 15 percent slopes. These deep, somewhat excessively drained and moderately well drained soils are on low dunes on alluvial valley floors. Elevation is 7,600 to 7,900 feet. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the frost-free season is 95 days.

The Space City soils make up about 60 percent of the unit, and the Hooper loamy sand soils make up about 40 percent.

The Space City soils are deep, somewhat excessively drained soils that formed in eolian sand on low dunes. Slopes range from 3 to 15 percent. Typically, the surface layer is grayish brown loamy sand about 8 inches thick. The underlying material to a depth of 60 inches is brown and light brownish gray loamy sand. It is calcareous below a depth of 18 inches.

Permeability is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, and the hazard of soil blowing is high.

The Hooper soils are deep, moderately well drained alkali soils that formed in alluvium derived from basalt and have a wind deposited surface layer. These soils are on flood plains and fans. Slope is 0 to 3 percent. Typically, the surface layer is pale brown loamy sand about 4 inches thick. The subsoil is pale brown clay about 26 inches thick. The substratum to a depth of 60 inches or more is light gray very gravelly sand. Soft masses of lime concretions are common above the sand and gravel substratum.

In Hooper soils, permeability is very slow. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, and the hazard of soil blowing is moderate. A high water table is within a depth of 4 to 6 feet during the summer months.

These soils are used as range and wildlife habitat.

The potential natural vegetation on the Space City soils is dominated by Indian ricegrass, blue grama, thickspike wheatgrass, and alkali sacaton. Common shrubs are fourwing saltbush, black greasewood, and rubber rabbitbrush. If the range deteriorates, the proportion of Indian ricegrass, thickspike wheatgrass, and alkali sacaton decreases, and that of inland saltgrass, forbs, and woody shrubs increases. Black greasewood and rubber rabbitbrush increase, and undesirable weeds and annual plants invade and become more abundant as the range condition declines.

The potential natural vegetation on the Hooper soils is dominated by alkali sacaton, alkali cordgrass, and greasewood. Rubber rabbitbrush, inland saltgrass, and western wheatgrass are prominent but widely spaced. If the range deteriorates, the proportion of the more

desirable grasses, such as alkali sacaton and western wheatgrass, decreases, and that of greasewood, rabbitbrush, and saltgrass increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Establishing rangeland seedlings on these soils is difficult because of the low rainfall, irregular topography, and the presence of salt and alkali. Deferred grazing, cross fencing, brush control, and stockwater developments are generally needed to prevent range deterioration and to promote the growth and increase of more desirable plant species.

Such wildlife as antelope and cottontail, coyote, and jackrabbit are best adapted to the habitat these soils support. Forage production is typically low, and livestock grazing management practices are needed if wildlife and livestock share the range. Livestock watering developments are also important to various wildlife species.

These soils are suited to homesite development. The main limitations are slope in areas of the Space City soils and wetness, very slow permeability, and alkali in areas of the Hooper soils. Special care is needed to prevent caving if these soils are excavated. To minimize soil loss, plant cover should be disturbed as little as possible during construction. Use of manure and supplemental sprinkler irrigation are needed to establish plantings on these soils. Designs for dwellings and roads can be modified to offset the soil limitations. Footings should be placed below the subsoil.

Septic tank absorption fields do not function properly in the Hooper soils because of very slow permeability in the upper 30 inches of the soil and rapid permeability in the substratum. If this unit is used for sewage lagoons or trench-type sanitary landfills, pollution of the ground water can occur because of rapid permeability. Ponds and reservoirs built on this unit need to be sealed by clay or other impervious materials to prevent seepage. Community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

These soils are in capability subclass VIIe, nonirrigated. Space City soils are in the Valley Sand range site, and Hooper soils are in the Salt Flats range site.

73—Tolman, dry-Rock outcrop complex, 9 to 65 percent slopes. This complex is on mountain and foothill side slopes. Elevation is 8,100 to 9,000 feet. The average annual precipitation is about 12 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 90 days.

The Tolman soils make up about 80 percent of the map unit, and Rock outcrop makes up about 20 percent of this unit.

The shallow, well drained, very stony Tolman soils formed in colluvium from rhyolitic tuff and are 10 to 20 inches thick over bedrock. Slopes range from 9 to 65 percent.

Typically, the surface layer of the Tolman soils is grayish brown very stony loam about 4 inches thick. The subsoil is dark grayish brown very cobbly clay loam about 6 inches thick. The substratum is yellowish brown extremely stony light clay loam about 3 inches thick. It directly overlies fractured rhyolitic tuff bedrock.

Permeability is moderate. Effective rooting depth ranges from 10 to 20 inches. Available water capacity is very low. Surface runoff is rapid, and the hazard of erosion is high to very high.

Rock outcrop consists of exposed tuff, rhyolite, andesite, and breccia.

The soils in this unit are used for range on the lesser slopes and for recreation and wildlife habitat.

The potential natural vegetation on this complex is dominated by western wheatgrass, needleandthread, Indian ricegrass, blue grama, pinyon pine, and juniper. In some areas, pinyon and juniper trees are dense. Shrubs include true mountainmahogany, wax currant, and gooseberry. If the range condition deteriorates, the proportion of western wheatgrass, needleandthread, and Indian ricegrass decreases, and that of blue grama, threeawn, snakeweed, and rabbitbrush increases.

Seeding rangeland is not recommended because of the steep and stony slopes and the low rainfall.

This complex provides habitat for such wildlife as bighorn sheep, deer, elk, coyote, and cottontail. Forage production is low.

Recreation on this unit is mainly hunting, hiking, and sightseeing.

The soils are poorly suited to homesite development. The main limitations are steep slopes, large stones, shallow depth to bedrock, and rock outcrops. Design modifications, the use of heavy equipment, and blasting are needed for construction. Natural vegetation should be disturbed as little as possible to help prevent soil losses.

The soils are in capability subclass VIIs and the Rocky Foothills range site.

74—Torsido loam, 0 to 1 percent slopes. This deep, poorly drained soil is on fans and terraces on alluvial valley floors. Elevation is 7,600 to 7,900 feet. The soil formed in alluvium derived from basalt. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 90 to 100 days.

Included in this unit are small areas of Gerrard loam, Alamosa clay loam, and Vastine loam.

Typically, the surface layer of this Torsido soil is dark gray loam about 8 inches thick. The subsoil is dark gray clay loam 15 inches thick. The substratum to a depth of 60 inches or more is pale brown very gravelly sand. Mottles are common in the subsoil and substratum.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight. A high water table is at 1 foot to 2 feet below the surface during the irrigation season.

This soil is used for irrigated pasture and range. Drainage and land leveling are necessary for crop production on this soil. Alfalfa and grasses are suited if drainage is established. Water-tolerant plants are well suited to pasture seeding on this soil.

The border method of irrigation is generally suitable for all crops grown.

The potential natural vegetation on this Torsido soil is dominated by slender and western wheatgrasses on the drier parts, and by tufted hairgrass, bluejoint reedgrass, and Nebraska sedge on the wettest parts. If the range deteriorates, the proportion of these more desirable plants decreases, and that of less desirable plants such as foxtail barley, Baltic rush, forbs, and woody shrubs increases. Undesirable weeds and annuals invade and become more abundant as range condition declines.

Seedbed preparation on this soil is difficult because of wetness. Renovating, deferred grazing, rotational grazing, cross fencing, and brush control are the practices most needed to prevent range deterioration and to promote the growth and increase of more desirable plant species.

This soil is well suited to shallow water developments. Open-water areas, which can be created by excavations or pothole blasting, improve habitat for waterfowl and shore birds. Because of the availability of moisture, this soil supports excellent waterfowl nesting cover if livestock grazing is carefully managed.

This soil is poorly suited to homesite development. The main limitations are the high water table and frost action. Drainage systems minimize frost heave. Community sewage systems are needed to prevent contamination of water supplies by seepage. Septic tank systems do not function properly on this soil and can cause pollution of ground water.

This soil is in capability subclasses IIIw, irrigated, and Vw, nonirrigated. It is in the Wet Meadow range site.

75—Torsido-Gerrard complex, 0 to 3 percent slopes. These poorly drained, deep soils are on flood plains, terraces, and fans on alluvial valley floors. Elevation is 7,600 to 8,000 feet. These soils formed in alluvium from basalt. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 90 days.

Torsido soils make up about 60 percent of this unit and the Gerrard soils make up 30 percent. The remaining 10 percent consists mainly of Vastine loam, Platoro loam, and San Arcacio sandy loam.

The Torsido soils are deep, poorly drained soils on flood plains and low-lying terraces. Slope is 0 to 1 percent.

Typically, the surface layer of the Torsido soils is dark gray loam about 8 inches thick. The subsoil is dark gray clay loam 15 inches thick. The substratum to a depth of 60 inches or more is grayish brown very gravelly sand. Mottles are common in the subsoil and substratum.

Permeability in the Torsido soils is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight. A high water table is at 1 foot to 2 feet below the surface during the irrigation season.

The Gerrard soils are poorly drained soils on flood plains and low-lying fans. Slope is 0 to 3 percent.

Typically, the upper part of the surface layer is dark gray loam 4 inches thick. The lower part is very dark grayish brown gravelly clay loam 4 inches thick. The subsoil is grayish brown gravelly sandy clay loam about 4 inches thick. The substratum to a depth of 60 inches is variegated light brown very gravelly loamy sand. Mottles are common in the subsoil and substratum.

Permeability in the Gerrard soils is moderate. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, and the hazard of erosion is slight. A high water table is at 1 foot to 1.5 feet below the surface during the irrigation season. The soil is subject to rare flooding.

Both the Torsido and Gerrard soils are used primarily for range. Some irrigated hay and pasture are also grown.

The potential natural vegetation on these soils is dominated by slender and western wheatgrasses on the drier parts, and by tufted hairgrass, bluejoint reedgrass, and Nebraska sedge on the wettest parts. If the range deteriorates, the proportion of these more desirable plants decreases, and that of less desirable plants, such as foxtail barley, Baltic rush, forbs, and woody shrubs, increases. Undesirable weeds and annuals invade and become more abundant as range condition declines.

Land leveling is needed if border irrigation is used. The width of the irrigated strip of land between the borders and the length of run can be adjusted to help prevent water loss, waterlogging, and salt buildup. Drainage is generally needed on these soils, and leaching salt from the root zone helps to promote the growth of grass or alfalfa.

Establishing rangeland seedlings on these soils is difficult because of wetness. Renovating, deferred grazing, rotational grazing, and brush control help prevent range deterioration and promote the growth of desirable plant species.

These soils are well suited to shallow water areas developed by excavation or pothole blasting. Such developments increase waterfowl and shore bird populations. Rangeland wildlife that use these soils include cottontail, jackrabbit, and coyote.

These soils are poorly suited to homesite development. The main limitations are flooding, the seasonal high water table, and frost action. Soil drainage minimizes frost heave.

These soils are in capability subclasses IIIw, irrigated, and Vw, nonirrigated. The range site is Wet Meadow.

76—Travelers very stony loam, 3 to 35 percent slopes. This shallow, somewhat excessively drained soil is on hills, ridges, and basalt-capped mesas. Elevation is 7,600 to 8,600 feet. The soil formed in colluvium derived from basalt. The average annual precipitation is about 9 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 90 days.

Included in this unit are small areas of Garita gravelly loam and Luhon loam. Also included are a few small areas of basalt Rock outcrop and some very steep to extremely steep rock escarpments that range in height from a few feet to 300 feet or more.

Typically, the surface layer of this Travelers soil is brown very stony loam about 4 inches thick. The subsoil is brown very stony loam about 7 inches thick. The substratum, which extends to a depth of about 13 inches, is very pale brown very stony loam that has much visible lime and overlies hard bedrock.

Permeability is moderate. Effective rooting depth is 12 to 20 inches. Available water capacity is very low, surface runoff is medium, and the hazard of erosion is moderate.

This soil is used as range.

The potential natural vegetation on this Travelers soil is dominated by Indian ricegrass, rubber rabbitbrush, and western wheatgrass, and smaller amounts of winterfat and blue grama. If the range deteriorates, the proportion of Indian ricegrass, western wheatgrass, and winterfat decreases, and that of threeawn, pricklypear, forbs, and woody shrubs increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Establishing rangeland seedlings on this soil is difficult because of the low rainfall, very low available water capacity, steep and rocky slopes, and shallow soil. Deferred grazing is generally needed to prevent range deterioration and to promote the growth and increase of more desirable plant species.

Wildlife such as antelope, cottontail, coyote, and jackrabbit are best adapted to the habitat on this droughty soil. Forage production is typically low, and livestock grazing management practices are necessary if wildlife and livestock share the range. Livestock watering developments are also important to various wildlife species.

This soil is poorly suited to homesite development. The main limitations are shallow depth to rock, large stones, and slope. Special designs are needed for roads and buildings on this soil. The use of heavy equipment and blasting are generally necessary for construction on this soil.

This soil is in capability subclass VIIs. It is in the Basalt Hills range site.

77—Travelers-Garita complex, 6 to 35 percent slopes. These soils are on basalt-capped mesas and foot slopes. Elevation is 7,800 to 8,600 feet. The average annual precipitation is 9 inches; the average annual air temperature is about 41 degrees F; and the frost-free period is about 90 days.

The Travelers soils make up about 55 percent of the unit, the Garita soils about 25 percent, and Rock outcrop about 20 percent.

The Travelers soils are shallow, somewhat excessively drained soils that formed in colluvium derived from basalt. Typically, the surface layer is brown very stony loam about 4 inches thick. The subsoil is brown very stony loam about 7 inches thick. The substratum, which extends to a depth of about 13 inches, is very pale brown very stony loam that has much visible lime and overlies hard bedrock.

Permeability in these Travelers soils is moderate. Effective rooting depth is 12 to 20 inches. Available water capacity is low, surface runoff is medium to rapid, and the hazard of erosion is moderate to high.

The Garita soils are deep and well drained. They formed in calcareous, gravelly alluvium derived from basalt. Typically, the surface layer is brown gravelly loam about 3 inches thick. The underlying material to a depth of about 6 inches is brown gravelly loam. Below this to a depth of about 21 inches is white very gravelly loam that has concentrated calcium carbonate accumulated in a moderately marly layer. Below this to a depth of 60 inches or more is very pale brown very gravelly loam that has less calcium carbonate than the layer above.

Permeability in these Garita soils is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

The soils are used as range and wildlife habitat.

The potential natural vegetation on the Travelers soils is dominated by Indian ricegrass, rabbitbrush, and western wheatgrass and small amounts of winterfat and blue grama. If the range deteriorates, the proportion of Indian ricegrass, western wheatgrass, and winterfat decreases, and that of threeawn, pricklypear, forbs, and woody shrubs increases. As the range condition declines, undesirable weeds and annual plants invade and become more abundant.

The potential natural vegetation on the Garita soils is dominated by winterfat, fourwing saltbush, Indian ricegrass, and squirreltail. If the range deteriorates, the proportion of these more desirable plants decreases, and that of plants such as threeawn, pricklypear, snakeweed, pingue, and other forbs increases. As the

range condition declines, undesirable weeds and annual plants invade and become more abundant.

Seeding rangeland on these soils is difficult because of the low rainfall, steep and rocky slopes, and shallow soil depth. Deferred grazing is generally needed to prevent range deterioration and to promote the growth and increase of more desirable plant species.

Such wildlife as antelope, cottontail, coyote, and jackrabbit are best adapted to the habitat on these soils. Forage production is typically low, and livestock grazing management practices are necessary if wildlife and livestock share the range. Livestock water developments are also important to various wildlife species.

These soils are poorly suited to homesite development. The main limitations are large stones, slope, and on the Travelers soils, shallowness to rock. Buildings and roads must be specially designed to overcome these limitations. Heavy equipment and blasting are generally required for construction on the Travelers soils.

The soils in this map unit are in capability subclass VIIs, nonirrigated. Travelers soils are in the Basalt Hills range site, and Garita soils are in the Limy Bench range site.

78—Uracca very cobbly loam, 15 to 45 percent slopes. This deep, well drained soil is on alluvial fans and mountain side slopes. Elevation is 7,800 to 8,500 feet. The soil formed in cobbly and gravelly alluvium derived from igneous and metamorphic rocks. The average annual precipitation is about 12 inches; the average annual air temperature is about 43 degrees F; and the average frost-free period is about 95 days.

Included in this unit are small areas of Comodore very stony loam, Cotopaxi sand, Mount Home very cobbly sandy loam, and soils that are similar to this Uracca soil but have a light grayish brown subsurface layer.

Typically, the surface layer of this Uracca soil is grayish brown very cobbly loam about 4 inches thick. The subsoil, to a depth of about 24 inches, is brown very cobbly clay loam in the upper part and light brown extremely cobbly sandy clay loam that has visible calcium carbonate in the lower part. The substratum to a depth of 60 inches is pink extremely cobbly sandy loam that has visible calcium carbonate.

Permeability is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is medium, and the hazard of erosion is moderate.

This soil is used as range, although grazing production is limited because of the many cobblestones and the thick stand of pinyon pine trees. Pinyon pine produces more than half the annual yield of plant material.

The Uracca soil is suited to the production of pinyon pine. It is capable of producing about 7 cords per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot.

The main restrictions to wood production are large stones and steep slopes, which limit the use of equipment. Erosion control measures are necessary to keep soil losses at a minimum. Large stones and droughty soils can influence the rate of seedling survival.

The potential natural vegetation on this soil is dominated by needleandthread, Indian ricegrass, western wheatgrass, and blue grama. If the range deteriorates, the proportion of needleandthread, Indian ricegrass, and western wheatgrass decreases, and that of blue grama, squirreltail, threeawn, snakeweed, and rabbitbrush increases. Some brushy plants such as fourwing saltbush, winterfat, and true mountainmahogany provide forage for livestock and wildlife.

Where grazing has been heavy, the plant cover is mostly pinyon pine, along with smaller amounts of juniper and brushy plants. Under these conditions, much of the soil surface is bare and supports only scattered grasses, mostly blue grama.

This soil is poorly suited to homesite development. The main limitations are large stones and steep slopes. Modifications of designs for roads and buildings and the use of heavy equipment are necessary for most construction on this soil. To keep soil loss to a minimum, special measures should be taken to disturb vegetation as little as possible. Septic tank absorption fields are not suited to this soil because of the steep slopes and large stones, and community sewage systems are needed for waste disposal.

This soil is in capability subclass VIIs, nonirrigated. It is in the Pinyon-Juniper Woodland range site.

79—Vastine loam. This deep, poorly drained soil is on flood plains on alluvial valley floors. Elevation is 7,600 to 8,200 feet. The soil formed in alluvium. The average annual air temperature is about 41 degrees F; the average annual precipitation is about 8 inches; and the average frost-free period is about 95 days.

Included in this unit are a few small areas of Big Blue clay loam, Gerrard loam, and Medano fine sandy loam.

Typically, the surface layer of this Vastine loam is dark gray loam about 8 inches thick. The subsoil is gray loam about 14 inches thick. The substratum to a depth of 60 inches is light brownish gray gravelly loamy sand.

Permeability is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the hazard of erosion is slight. A high water table is within 1.0 to 2.5 feet of the surface during the irrigation season. Flooding is common during the summer.

This soil is used as range and for some irrigated pasture and hayland.

The potential natural vegetation on this soil is dominated by western and slender wheatgrasses on the drier parts, and by tufted hairgrass, bluejoint reedgrass, and Nebraska sedge on the wet areas. If the range deteriorates, the proportion of the more desirable plant

species decreases, and that of the less desirable plants, such as foxtail barley, Baltic rush, and woody shrubs, increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Seeding rangeland on this soil is difficult and costly because of wetness. Renovating, brush control, deferred grazing, and rotational grazing help prevent range deterioration.

Suitable irrigation methods are border and sprinkler systems. Protection from flooding and soil drainage help prevent salt buildup and waterlogging of the soil. Alfalfa and grasses are suited to this soil if drainage is established. Water-tolerant plants are most suitable for pasture seeding on this soil.

This soil supports habitat for such wildlife as deer, jackrabbit, cottontail, and coyote. Wildlife populations can be increased by livestock grazing management practices and stockwater developments.

This soil is poorly suited to homesite development. The main limitations are the high water table, flooding, and frost action. Practices needed to offset these limitations are soil drainage and modifications of road designs.

This soil is in capability subclasses IIIw, irrigated, and Vw, nonirrigated. It is in the Wet Meadow range site.

80—Vastine loam, alkali. This deep, poorly drained soil is severely affected by alkali and salts. It is on flood plains on alluvial valley floors. Elevation is 7,600 to 8,200 feet. The soil formed in alluvium. The average annual air temperature is about 41 degrees F; the average annual precipitation is about 8 inches; and the average frost-free season is about 95 days.

Included in this unit are a few small areas of Big Blue clay loam, Gerrard loam, and Medano loam.

Typically, the surface layer of this Vastine soil is dark gray loam about 8 inches thick. The subsoil is gray loam about 16 inches thick. The substratum to a depth of 60 inches is light brownish gray gravelly loamy sand.

Permeability is moderate. Available water capacity is low. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the hazard of erosion is slight. A high water table is within 2.0 to 3.5 feet of the surface during spring and summer in most years. Flooding occurs in some years during the snowmelt season.

This soil is primarily used as range. Some areas are used for irrigated pasture, hayland, or small grains.

The potential natural vegetation on this soil is dominated by alkali sacaton, slender and western wheatgrass, creeping wildrye, Nebraska sedge, inland saltgrass, and Baltic rush. Black greasewood and rubber rabbitbrush are common but widely spaced. If the range deteriorates, the proportion of the more desirable forage species decreases, and that of foxtail barley, black greasewood, sedges, and rushes increases. Undesirable weeds and annuals invade and become more abundant as the range condition declines.

Land leveling, soil drainage, and leaching of salts from the root zone are needed for irrigated crop production on this soil. Drainage outlets may be difficult to find. Soil amendments, such as sulfuric acid or gypsum, help in the leaching process.

The furrow method of irrigation is suitable for row crops. Border irrigation is suited to alfalfa and pasture. Regardless of the irrigation method used, proper lengths of run and timing are needed to keep water loss at a minimum and to help prevent the accumulation of additional salt and alkali in the surface layer.

Seeding rangeland is difficult and costly because of wetness and alkalinity. Deferred grazing, cross fencing, stockwater developments, and brush control help prevent range deterioration.

Nonirrigated areas of this soil have limited potential for wildlife habitat because of low vegetative production. Jackrabbit, cottontail, and coyote use these areas. Crop residue from oats and barley on irrigated land provides food for pheasant and waterfowl.

This soil is poorly suited to homesite development. The main limitations—the high water table, alkalinity, salt, and frost action hazard—can be overcome by soil drainage and modification of road and building designs.

This soil is in capability subclasses IIIsw, irrigated, and VIIw, nonirrigated. It is in the Salt Meadow range site.

81—Villa Grove sandy clay loam. This deep, well drained soil is on flood plains and terraces on alluvial valley floors. Elevation is 7,600 to 8,000 feet. The soil formed in alluvium. The average annual precipitation is about 7 inches; the average annual air temperature is about 41 degrees F; and the average frost-free period is about 95 days.

Included in this unit are small areas of Platoro loam and Luhon loam, both having slope of 0 to 1 percent. Also, some small areas have become seeped as a result of irrigation and are affected by salts. These areas have a seasonal water table at a depth of 3 to 4 feet during the irrigation season.

Typically, the surface layer is brown sandy clay loam about 8 inches thick. The upper part of the subsoil is brown and pale brown clay loam about 10 inches thick. The lower part of the subsoil is very pale brown sandy clay loam 14 inches thick. The substratum to a depth of 60 inches is very pale brown and yellowish brown gravelly sandy loam.

Permeability is moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight.

This soil is used for irrigated crops of alfalfa and small grains and for range. Commercial fertilizers, manure, and plant residue are commonly needed. Generally, all crops

except legumes respond to nitrogen and phosphate fertilizers. Legumes respond to phosphate fertilizer.

Border and sprinkler irrigation methods are suitable for this soil. Sprinkler irrigation is well suited to most crops. If border irrigation is used, land leveling is needed to help obtain the proper water distribution and prevent waterlogging and salt buildup in the soil surface. Minimum tillage practices and high-residue crops help prevent soil blowing.

The potential natural vegetation on this Villa Grove soil is dominated by alkali sacaton, alkali cordgrass, and greasewood. Rubber rabbitbrush and inland saltgrass are prominent but widely spaced. If the range deteriorates, the proportion of more desirable grasses, such as alkali sacaton and western wheatgrass, decreases, and that of greasewood, rubber rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become more abundant as the range condition declines.

Establishing rangeland seedlings is difficult because of the low rainfall. Deferred grazing, cross fencing, stockwater developments, and brush control help prevent range deterioration and promote the growth and increase of more desirable plant species.

Wildlife such as antelope, cottontail, coyote, and jackrabbit are best adapted to the habitat the soil supports. Forage production is typically low, and proper livestock grazing management is necessary. Livestock watering developments are important to various wildlife species. Where the soil is irrigated, wildlife populations can be increased if food and cover are provided.

This soil is well suited to homesite development. Buildings and roads should be designed to offset this soil's limited ability to support a load. If this soil is used for septic tank absorption fields, the moderate permeability can be overcome by increasing the size of the absorption field.

This soil is in capability subclasses IIIs, irrigated, and VIIs, nonirrigated. It is in the Salt Flats range site.

Prime Farmland

In this section, prime farmland is defined and discussed, and the prime farmland soils in the survey area are listed.

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in providing the nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, feed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. The moisture supply, of course, must be adequate, and the growing season has to be sufficiently long. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be in use as cropland, pasture, or woodland, or they may be in other uses. They either are used for producing food or fiber or are available for these uses. Urban or built-up land and water areas cannot be considered prime farmland.

Prime farmland soils usually get an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing seasons are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not flooded during the growing season. The slope ranges mainly from 0 to 6 percent.

Soils that have a high water table or that are droughty may qualify as prime farmland soils if the limitations are overcome by drainage or irrigation. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information on the criteria for prime farmland soils can be obtained at the local office of the Soil Conservation Service.

About 76,000 acres, or about 8.4 percent of the Saguache County Area, meets the requirements for prime farmland if the soils are irrigated. The areas are mainly on the floor of the San Luis Valley and are mostly in general soil map units 1, 3, 5, and 7. Approximately 40,000 acres of this prime farmland is used for irrigated crops. Crops grown on this land, mainly barley and alfalfa, account for an estimated 30 percent of the county's total agricultural income each year.

A recent trend in some parts of Colorado has been the loss of some prime farmlands to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and difficult to cultivate, and usually less productive.

The following map units, or soils, make up prime farmland in the survey area if they are irrigated. The location of each map unit is shown on the detailed soil map at the back of this publication. The extent of each unit is given in table 4. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

39 Jodero loam, 0 to 3 percent slopes
43 Luhon loam, 0 to 3 percent slopes
44 Luhon loam, 3 to 6 percent slopes
45 McGinty sandy loam, 0 to 3 percent slopes
48 Monte loam, 0 to 3 percent slopes
55 Platoro loam, 0 to 3 percent slopes
62 San Arcacio sandy loam
64 San Luis sandy loam, drained
65 Schrader sandy loam, 0 to 3 percent slopes
69 Shawa loam, 0 to 4 percent slopes
81 Villa Grove sandy clay loam

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Richard T. Sparks, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

According to the Colorado Agricultural Statistics (*9*), Saguache County had about 80,000 acres of irrigated cropland in 1979. Malting barley, the primary small grain, accounted for over 23,500 acres. The acreage of soft white spring wheat and a small acreage of hard red spring wheat had increased to about 8,800 acres. Oats accounted for about 2,500 acres.

Potatoes, the major row crop grown in Saguache County, accounted for about 7,200 acres. Head lettuce, also a major crop, had over 2,000 acres grown. Saguache County produces one-third to one-half of Colorado's annual lettuce crop.

The acreage of alfalfa and other hay crops decreased over the past several years, and in 1979, accounted for about 36,000 acres.

About 112,000 acres of irrigated pasture and native hay furnish summer pasture and winter feed for livestock.

The soils and climate of the survey area are well suited to the production of crops commonly grown in the San Luis Valley. The high altitude, high solar radiation levels, warm days, and cool nights combine to produce small grains of high quality and low protein levels and alfalfa of high quality and high protein levels. The low incidence of crop diseases helps make the survey area an ideal seed-growing area for potatoes and small grains. Saguache County's climate and short growing season somewhat restrict the selection of crops. Warm-season crops, such as corn, sorghum, and soybeans, do not grow well in the survey area.

Deep sandy and gravelly soils, such as Gunbarrel, Mosca, McGinty, Norte, and Dunul soils, are well suited to potatoes. Sprinkler irrigation works well on these soils. Barley, wheat, alfalfa, and other adapted crops grow well on these deep sandy and gravelly soils and on the medium textured soils, such as Luhon, Monte, Platoro, San Arcacio, San Luis (drained), and Villa Grove.

A large increase in the acreage of cropland would be difficult. Much of the land area within the San Luis Valley, which extends beyond the survey area, would need major reclamation, such as drainage, soil amendments, and the development of irrigation systems, for crop production. Many areas of the San Luis Valley have good possibilities for the development of irrigation wells. However, salt- and alkali-affected soils, many having clayey texture, and the presence of a high water table cause many problems that are difficult and costly to overcome when converting rangeland to cropland. Soils such as Arena, Biedell, Harlem, and Hooper are not suited to conversion to cropland.

Because farming in Saguache County Area depends on irrigation, the conversion of rangeland to cropland requires the development of adequate irrigation water. Use of irrigation methods that conserve water and development of new irrigation wells are possible ways in which more water can be made available for irrigation. In some places, however, the development of new irrigation wells has already caused a drop in the water level and a need to increase the depth of the wells and increase pumping power in order to provide adequate water for existing irrigation systems.

Most of the arable soils in the survey area respond well to the addition of nitrate and phosphate fertilizers. The content of potash in the soils is normally adequate, and crops generally do not respond to potash fertilizer. Most of the soils are mildly to very strongly alkaline, and often plant nutrients are not readily taken up by many plants because of salts and alkali in the soil. Soils such as Arena, Biedell, Harlem, Hooper, Mosca, and San Luis require heavy applications of gypsum, sulfuric acid, or other soil amendments that lower the pH and make the soil permeable enough to leach sodium salts from the root zone of most plants (*21*). The use of irrigation water in excess of plant needs is also necessary for the salt leaching process. On all soils, the amount of fertilizer or soil amendments used should be based on the results of soil tests, on the needs of the crop, and on the expected yield. The Cooperative Extension Service can help to determine the kind and amount of fertilizer and soil amendments to apply.

Organic matter is an important source of nitrogen for crops. It also helps increase the rate of water intake, reduce surface crusting, reduce soil losses from erosion, and promote good tilth. Most of the soils in the survey area that are used for crops have a surface layer of sandy loam, gravelly sandy loam, loam, or loamy sand and have low organic matter content and weak structure. Soil blowing is a hazard on these soils because precipitation is low and spring winds reach high velocity. Regular additions of manure and plant residue increase the soil's organic matter content and improve its structure. Using minimum tillage practices and leaving crop residue on the surface help prevent soil blowing.

Because of low rainfall and the nearly level topography of the valley floor, water erosion is a hazard on less than 1 percent of the cropland in the survey area. The hazard of soil blowing is high on about 25 to 30 percent of the irrigated cropland and moderate on about 50 percent of the irrigated cropland in the survey area. Also, about 30 percent of the rangeland consists of soils having a sandy surface layer that is subject to soil blowing if the plant cover is depleted.

Erosion by water or wind reduces the productivity of the soil. If the surface layer is lost through erosion, most of the available plant nutrients and organic matter, which improve soil structure, water infiltration, available moisture capacity, and general tilth, are also lost. Soil blowing deposits sediments that clog irrigation canals, field and road ditches, and drains, and it also diminishes air quality. Controlling soil blowing minimizes such pollution and improves the quality of the environment.

Conservation tillage practices and perennial vegetation protect the soil's surface, reduce runoff, and increase infiltration of air and water. A cropping system that keeps a plant cover on the soil for extensive periods reduces erosion and preserves the productive capacity of the soils. Using legume and grass forage crops in the cropping system reduces erosion, provides nitrogen to plants, and improves soil tilth for the crop that follows.

On all soils, erosion can be reduced by minimum tillage, use of crop residue, conservation tillage, and use of cropping systems that rotate alfalfa, grass, or close-growing crops with row crops. Soil blowing on the sandy Gunbarrel, Mosca, Cotopaxi, and Space City soils can be reduced by maintaining a plant cover or using conservation tillage practices. On the Dunul, Graypoint, Norte, and Saguache soils, which have gravel on the surface, soil blowing can also be reduced by avoiding land planing operations in the spring and by maintaining surface roughness and soil moisture after spring planting. Shrub and tree windbreaks are effective in reducing soil blowing; however, their use is somewhat restricted to farmsteads because the herbicides used on windbreaks can damage cropland.

Drainage of excess water is needed on about 10 percent of the acreage used for crops in the survey area. Much of the acreage is also affected by salts or alkali, or by both. Because of the nearly level topography of the valley floor, drainage outlets can be hard to find. The Alamosa, Biedell, Big Blue, Hagga, Medano, and Vastine soils are naturally wet and are not suitable for crop production unless they are artificially drained.

The design of surface and subsurface drainage systems varies according to the kind of soil. A combination of surface and subsurface drainage is needed in most poorly drained soils that are intensively cropped.

Information on erosion control, drainage practices, and leaching salts from the soil can be obtained from the local office of the Soil Conservation Service.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (*24*). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Rangeland

Noel H. Wellborn, range conservationist, Soil Conservation Service, helped prepare this section.

About 57 percent of Saguache County Area is rangeland. In addition, small areas of woodland and irrigated pasture are grazed in conjunction with the rangeland.

Cow-calf-steer and sheep operations are common practices. The average ranch is about 2,400 acres and usually has additional grazing leases on public land. Typically, a ranch has some irrigated pasture and hayland to supplement the forage produced on the rangeland. During the winter the native forage is supplemented with hay and protein concentrate.

Because soils, along with topography and precipitation, strongly influence the native vegetation, the general soil map units can be grouped according to characteristics that affect rangeland and related grazing land.

Soils mainly in map units 1, 2, 3, and 4 .—These soils on the valley floor are affected by a water table, excess salts, and alkali. Sizable blocks of these soils are used as rangeland, and a number of small tracts are used as irrigated cropland. Some soils are capable of high forage production, and because of low precipitation, others have very low value for grazing.

Soils mainly in map units 5, 6, 7, 8, and 9 .—These soils are on broad, well drained sandy and gravelly fans immediately below the mountains. Because they receive slightly more precipitation, they are well suited to use as rangeland.

Soils in map units 10, 11, 12, 13, and 14 .—These shallow stony soils are mainly on rough mountainous land along the northern, eastern, and western edges of the survey area. The soils in this group receive the most precipitation. Nearly all the acreage is grazed by either livestock or wildlife, or both. The grassland is well suited to livestock grazing.

The native vegetation in most of the survey area has been greatly depleted by continued excessive use. The major grasses on the valley floor have in many places been replaced by black greasewood and rabbitbrush.

Proper grazing use includes deferment of grazing. Proper grazing use is the major management concern of rangeland conservation. It requires the control of grazing so that the kinds and amounts of plants that make up the potential natural plant community are reestablished and maintained. To obtain proper grazing use, 50 percent of the season's growth should be deferred until the end of the grazing period.

Deferment of grazing favors the improvement or maintenance of the condition of a range site. It is the delay of grazing until key forage plants have strengthened the root system during the early part of the growing season. When this practice is worked into planned grazing systems on a recurring basis, key forage plants have the opportunity to produce more seed.

Fencing, properly located watering areas, and salt blocks help to obtain more uniform distribution of grazing.

Rangeland furrowing, chiseling, and pitting are mechanical treatments designed to capture runoff, improve water intake, prevent erosion, and speed recovery of vegetation.

Range seeding may be employed, where there is enough rainfall, to improve depleted rangeland and thereby control erosion by water and wind. Brush control is beneficial in areas where competitive shrubs have increased beyond the amount found in the potential natural plant community.

Applying sound range management based on information in this soil survey and on rangeland inventories can increase productivity of the rangeland.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 6 shows, for each soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to use as rangeland are listed. Explanation of the column headings in table 6 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name (*12*). Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, reduction of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Woodland Management and Productivity

Only about 1 percent of the Saguache County Area is in woodland. The pinyon-juniper forest type (*17*) is in map units 11 and 14, which are described in the section "General soil map units." Ponderosa pine (*14*) and mixed conifer types are mainly in the drier parts of map units 12 and 14. Engelmann spruce is predominant at elevations of more than 10,000 feet and on some north-facing slopes, mainly in map unit 12. Cottonwood and willow are in small areas adjacent to streams on the floor of the San Luis Valley and in the foothills, mainly in map unit 1.

Suggestions for woodland management are given in the descriptions of the detailed soil map units that consist of soils suitable for wood crops.

Woodland Understory Vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Some woodland, if well managed, can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

In this survey area, rangeland vegetation is the woodland understory vegetation. For those soils suitable for woodland use, consult table 6 to determine the potential for producing understory vegetation and the names of the characteristic vegetation.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

Recreation

The soils of the survey area are rated in table 7 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 7, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, or limited use, or by a combination of these measures.

The information in table 7 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table

10 and interpretations for dwellings without basements and for local roads and streets in table 9.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife Habitat

Eldie W. Mustard, state biologist, Soil Conservation Service, helped prepare this section.

Wildlife is a product of the soil on which it lives. From the soil must come various components which make up the areas where wildlife can find places to feed, breed, rear young, rest, and escape enemies. The soil must provide food, cover, and water, which collectively is known as wildlife habitat.

The available habitat, including both quality and quantity, largely determines the kinds of wildlife. The three factors which greatly influence wildlife populations in the Saguache County Area are land use, management, and water.

Where water is available for irrigation of crops, land use in the Saguache County Area is often changed from rangeland to cropland. This change in land use greatly affects the kinds of wildlife. For example, land that was once rangeland and supported wildlife species endemic to rangeland may now support waterfowl and pheasants because its land use was converted from range to cropland.

There is much diversity in habitat types available to a broad range of wildlife species in the survey area because the elevation differs widely from a semidesert regime at 7,600 feet to conifer-covered mountainous habitats at 9,000 to about 12,000 feet. Also, contributing to the diversity of habitat is the presence of streams, such as Saguache Creek, Carnero Creek, and La Garita Creek. Irrigated farming has appurtenances, such as irrigation canals, ditches, drains, and flowing artesian wells, to attract many kinds of wildlife.

Important wildlife species in the Saguache County Area include elk, mule deer, pronghorn antelope, black bear, bighorn sheep, blue grouse, mourning dove, pheasant, duck, geese, cottontail, snowshoe hare, black-tailed jackrabbit, and white-tailed jackrabbit. Some of the mammalian predators and furbearers are red fox, gray fox, coyote, long-tailed weisel, badger, raccoon, striped skunk, spotted skunk, bobcat, mountain lion, beaver, and muskrat.

Numerous birds, including bald eagle, golden eagle, crow, raven, burrowing owl, great horned owl, several species of swallows, black-billed magpie, sandhill crane, meadowlark, American kestrel, peregrine falcon, loggerhead shrike, mountain plover, blue heron, and many shore birds inhabit the survey area. Also present is the prairie rattlesnake, along with many amphibians and reptiles.

Successful management of wildlife on any tract of land requires mainly that food, cover, and water be available in a suitable combination. Lack of any one of these necessities, unfavorable balance between them, or poor distribution of them may severely limit or account for the absence of desirable wildlife species. Soils information provides a valuable tool in creating, improving, or maintaining suitable food, cover, and water for wildlife.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 8, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management,

and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are proso millet, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are alfalfa, orchardgrass, wheatgrass, smooth bromegrass, yellow sweetclover, and alsike clover.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are pricklypear, sand dropseed, Parry oatgrass, saltgrass, alkali sacaton, ring muhly, western wheatgrass, blue grama, and yucca.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are cottonwood, Gambel oak, and chokecherry, skunkbush sumac, shrubby cinquefoil, willow, and aspen. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, currant, honeysuckle, caragana, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth to the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are mountainmahogany, bitterbrush, snowberry, rabbitbrush, greasewood, and big sagebrush, fourwing saltbrush, and winterfat.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, cattail, Baltic rush, bulrushes, inland saltgrass, wild iris, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include western bluebird, killdeer, marsh hawk, pheasant, mourning dove, meadowlark, sparrow, jackrabbit, coyote, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include snowshoe hare, blue grouse, pine siskin, woodpecker, squirrel, mule, deer, elk, mountain lion, and black bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are duck, geese, avocets, shore birds, heron, kingfisher, raccoon, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include bighorn sheep, elk, antelope, mule deer, coyote, jackrabbit, American kestrel, and meadowlark bunting.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the

most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index (*16*), soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density (*6*). Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 9 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high

water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 10 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 10 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated

slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 11 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill (*7*). The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential (*4*).

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 11, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to

40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 12 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics (*26*).

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 13 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 14 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet

and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.
5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.
6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.
7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.
8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 14, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 15 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 15 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it

occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 15 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 15.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Not shown in the table is subsidence caused by an imposed surface load or by the withdrawal of ground water throughout an extensive area as a result of lowering the water table.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*27*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 16 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquents (*Hapl*, meaning minimal horizonation, plus *aquent*, the suborder of the Entisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, nonacid, mesic Typic Haplaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*20*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*27*). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Acasco Series

The Acasco series consists of deep, poorly drained soils that are on terraces and fans on alluvial valley floors. These soils formed in alluvium derived principally from basalt. The slope is 0 to 1 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are clayey over sandy-skeletal, montmorillonitic, frigid Typic Haplaquolls.

Typical pedon of Acasco clay loam, about 2,500 feet east and 200 feet south of the NW corner of sec. 14, T. 41 N., R. 7 E.

A1—0 to 9 inches; gray (10YR 5/1) clay loam, very dark brown (10YR 2/2) moist; few fine distinct yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure; hard, firm, sticky and plastic; 5 percent gravel and 5 percent cobblestones; neutral; gradual wavy boundary.
B2g—9 to 24 inches; grayish brown (10YR 5/2) heavy clay loam, dark grayish brown (10YR 4/2) moist; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; hard, firm, sticky and plastic; 5 percent gravel and 5 percent cobblestones; neutral; gradual wavy boundary.
IICg—24 to 60 inches; gravelly sand; neutral.

Depth to the seasonal high water table is 1.5 to 2.0 feet. Depth to the IIC horizon ranges from 20 to 36 inches. Rock fragments make up 0 to 35 percent of the control section. Hue ranges from 5Y through 7.5YR. Mottling ranges from faint to prominent. Clay content in the control section is 35 to 60 percent.

Alamosa Series

The Alamosa series consists of deep, poorly drained soils that are on flood plains and fans on alluvial valley floors. These soils formed in alluvium. The slope is 0 to 1 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy, mixed, frigid Typic Argiaquolls.

Typical pedon of Alamosa clay loam, about 600 feet south and 200 feet west of the NE corner of sec. 26, T. 42 N., R. 8 E.

A1—0 to 3 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; few fine faint yellowish brown (10YR 5/6) mottles; moderate fine granular structure; slightly hard, friable, sticky and plastic; moderately alkaline; clear smooth boundary.
B21t—3 to 11 inches; grayish brown (10YR 5/2) clay loam, very dark brown (10YR 2/2) moist; few fine faint yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; hard, friable, sticky and plastic; few thin patchy clay films on faces of peds; moderately alkaline; clear smooth boundary.
B22t—11 to 18 inches; grayish brown (10YR 5/2) clay loam, very dark brown (10YR 2/2) moist; few medium faint dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; hard, friable, sticky; moderately alkaline; clear smooth boundary.
B23t—18 to 24 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few thin patchy clay films on faces of peds; moderately alkaline; clear smooth boundary.
Bcs—24 to 32 inches; light yellowish brown (10YR 6/4) sandy clay loam, dark brown (10YR 4/3) moist; common medium distinct pale olive (5Y 6/3) mottles; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; moderately alkaline; clear smooth boundary.
Cg—32 to 60 inches, pale brown (10YR 6/3) gravelly loamy sand, brown (10YR 5/3) moist; many medium and fine distinct pale olive (5Y 6/3) mottles; massive; slightly hard, very friable, nonsticky and nonplastic; 20 percent gravel; moderately alkaline.

Depth to the seasonal high water table is 1 foot to 1.5 feet. Hue ranges from 5Y to 7.5YR in most pedons. Clay content in the control section ranges from 18 to 35 percent. Mottling is faint to prominent.

Arena Series

The Arena series consists of moderately deep, poorly drained saline-alkaline soils that are on flood plains and fans on alluvial valley floors. These soils formed in alluvium. The slope is 0 to 1 percent. The average annual precipitation is about 7 inches, and the average air temperature is about 41 degrees F.

These soils are fine-loamy, mixed, frigid Aquentic Durorthids.

Typical pedon of Arena loam, about 1,550 feet north and 2,400 feet east of the SW corner of sec. 30, T. 43 N., R. 10 E.

A1—0 to 10 inches; light brownish gray (10YR 6/2) heavy loam, brown (10YR 5/3) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; calcareous; strongly alkaline; clear smooth boundary.
C1cag—10 to 34 inches; light yellowish brown (10YR 6/4) heavy loam, dark yellowish brown (10YR 4/4) moist; few fine prominent mottles, very dark grayish brown (10YR 3/2) moist; weak medium and fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; calcareous; lime visible in spots and streaks; strongly alkaline; clear smooth boundary.
C2si—34 to 58 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; hard brittle peds that are 0.5 to 10 centimeters in diameter and about 1 to 5 centimeters thick and can be dug with a spade when moist; will not slake in acid or water, but will soften after alternate treatment in strong base and acid; abrupt smooth boundary.
C3—58 to 68 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist;

massive; hard, friable, sticky and plastic; strongly alkaline.

Depth to the seasonal water table is 1 to 2 feet. Depth to calcareous material ranges from 0 to about 6 inches. Depth to the duripan ranges from 20 to 40 inches. Coarse fragments make up 0 to 20 percent of the pedon and are dominantly 0.5 inch to 3 inches in diameter.

Biedell Series

The Biedell series consists of deep, poorly drained alkali soils on old lakebeds and in overflow depressions on alluvial valley floors. These soils formed in alluvium from igneous rock. The slope is 0 to 1 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are clayey over sandy or sandy-skeletal, montmorillonitic, frigid Aquic Natrargids.

Typical pedon of Biedell clay loam, about 1,900 feet south and 1,700 feet west of the NE corner of sec. 11, T. 42 N., R. 8 E.

A2—0 to 3 inches; very pale brown (10YR 7/3) clay loam, brown (10YR 5/3) moist; moderate very thin platy structure parting to weak fine granular; soft, very friable, slightly sticky and plastic; calcareous; moderately alkaline; clear smooth boundary.

B21t—3 to 9 inches; light yellowish brown (10YR 6/4) heavy clay loam, yellowish brown (10YR 5/4) moist; moderate medium columnar structure parting to moderate medium subangular blocky; very hard, firm, sticky and very plastic; calcareous; very strongly alkaline; gradual smooth boundary.

B22t—9 to 27 inches; light yellowish brown (10YR 6/4) heavy clay loam, yellowish brown (10YR 5/4) moist; few medium and fine faint brown (7.5YR 5/2) and strong brown (7.5YR 5/8) moist mottles; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic; calcareous; very strongly alkaline; gradual smooth boundary.

C1ca—27 to 32 inches; very pale brown (10YR 8/4) clay loam, light yellowish brown (10YR 6/4) moist; common fine prominent black (2.5Y N/2) and strong brown (7.5YR 5/8) moist mottles; massive; very hard, friable, sticky and very plastic; calcium carbonate visible in seams and large spots; calcareous; very strongly alkaline; clear smooth boundary.

IIC2—32 to 60 inches; light brownish gray (10YR 6/2) gravelly sand, dark grayish brown (10YR 4/2) moist; single grained; loose, nonsticky and nonplastic; 20 percent gravel; calcareous; strongly alkaline.

Depth to the seasonal water table is 2 to 3 feet. Exchangeable sodium makes up 15 to 60 percent of the B horizon and most of the subhorizons, but is less than 15 percent of the A2 horizon in some pedons. Depth to uniformly calcareous material normally ranges from 0 to 12 inches. Depth to continuous subhorizons of calcium carbonate, calcium sulfate, or other soluble salt accumulations ranges from 12 to 30 inches. Rock fragments make up 0 to 15 percent of a major part of the solum and are dominantly 1/2 inch to 3 inches in diameter.

Big Blue Series

The Big Blue series consists of deep, poorly drained soils that formed on flood plains and terraces on alluvial valley floors. These soils formed in fine textured, calcareous alluvium. The slope is 0 to 3 percent. The average annual precipitation is about 10 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine, montmorillonitic (calcareous), frigid Typic Haplaquolls.

Typical pedon of Big Blue clay loam, 0 to 3 percent slopes, about 1,800 feet west and 500 feet north of the SE corner of sec. 18, T. 46 N., R. 10 E.

O1—2 inches to 0; decayed grasses and roots.

A11—0 to 5 inches; gray (10YR 5/1) clay loam, black (10YR 2/1) moist; weak very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; calcareous; strongly alkaline; clear smooth boundary.

A12—5 to 11 inches; brown (7.5YR 5/2) loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure that parts to moderate fine granular; hard, very friable, slightly sticky and slightly plastic; calcareous; strongly alkaline; gradual smooth boundary.

A13—11 to 16 inches; brown (7.5YR 5/2) clay loam, dark brown (7.5YR 4/2) moist; weak medium subangular blocky structure that parts to moderate fine granular; hard, very friable, slightly sticky and slightly plastic; calcareous; moderately alkaline; gradual smooth boundary.

B21—16 to 26 inches; light brownish gray (10YR 6/2) clay loam, dark gray (10YR 4/1) moist; few fine prominent strong brown (7.5YR 5/8) mottles; massive; very hard, friable, sticky and plastic; calcareous; moderately alkaline; gradual smooth boundary.

B22g—26 to 38 inches; light gray (10YR 7/1) clay loam, dark yellowish brown (10YR 4/4) moist; many large distinct strong brown (7.5YR 5/8) mottles; massive; very hard, friable, sticky and plastic; calcareous; moderately alkaline; gradual smooth boundary.

Cg—38 to 60 inches; light gray (10YR 7/1) gravelly sandy clay loam, grayish brown (10YR 5/2) moist; common medium prominent strong brown (7.5YR 5/8) mottles; massive; very hard, friable, slightly sticky and slightly plastic; 25 percent gravel; calcareous; moderately alkaline.

Depth to the seasonal water table is 0.5 foot to 1.0 foot. Depth to calcareous material ranges from 0 to 6 inches. Hue ranges from 2.5Y through 7.5YR. Rock fragments make up 0 to 15 percent of a major part of the control section. Clay content ranges from 35 to 50 percent in the B2 horizon.

Bushvalley Series

The Bushvalley series consists of shallow, well drained soils on mountain side slopes and ridges. These soils formed in colluvium from igneous rock. The slope is 3 to 65 percent. The average annual precipitation is about 18 inches, and the average annual air temperature is 36 degrees F.

These soils are loamy-skeletal, mixed Argic Lithic Cryoborolls.

Typical pedon of Bushvalley cobbly loam, in an area of Bushvalley-Gelkie-Rock outcrop complex, 3 to 65 percent slopes, about 600 feet north of Forest Service fence and 1,000 feet east of the SW corner of sec. 15, T. 42 N., R. 5 E.

A1—0 to 4 inches; dark brown (10YR 4/2) cobbly loam, dark grayish brown (10YR 2/2) moist; weak medium subangular blocky structure that parts to moderate fine granular; slightly hard, very friable, slightly sticky and slightly plastic; 25 percent cobblestones and 10 percent gravel; slightly acid; clear smooth boundary.

B2t—4 to 13 inches; brown (7.5YR 4/2) extremely cobbly clay loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; 45 percent cobblestones and 20 percent gravel; neutral.

R—13 inches; hard conglomerate bedrock.

Depth to bedrock ranges from 7 to 20 inches. Clay content of the B2t horizon ranges from 18 to 35 percent. Rock fragments make up 50 to 70 percent of the B2t horizon.

Cheadle Series

The Cheadle series consists of shallow, well drained soils on mountain side slopes and ridges. These soils formed in colluvium and residuum from rhyolite and welded tuff. The slope is 3 to 35 percent. The average annual precipitation is about 16 inches, and the average annual air temperature is about 38 degrees F.

These soils are loamy-skeletal, mixed Lithic Cryoborolls.

Typical pedon of Cheadle channery loam, in an area of Hopkins-Cheadle-Rock outcrop complex, 3 to 35 percent slopes, about 750 feet north and 3,600 feet east of the SW corner of sec. 36, T. 46 N., R. 4 E.

A1—0 to 9 inches; brown (7.5YR 5/2) channery loam, dark brown (7.5YR 3/2) moist; weak coarse platy structure that parts to moderate fine granular; soft, very friable, nonsticky and nonplastic; about 18 percent channers; neutral; clear smooth boundary.

Cca—9 to 15 inches; brown (10YR 5/3) very channery loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; about 50 percent channers that are 1 to 2 inches thick, 8 to 12 inches long, and 2 to 10 inches wide; calcium carbonate coatings visible on lower sides of some channers; mildly alkaline; abrupt smooth boundary.

R—15 to 60 inches; hard, welded tuff bedrock.

Depth to bedrock ranges from 10 to 20 inches. Rock fragments typically make up 35 to 85 percent of the textural control section. Calcium carbonate in the C horizon ranges from nearly white, visible forms to thin coatings on the underside of the rock fragments.

Comodore Series

The Comodore series consists of shallow, well drained soils on ridges and mountain side slopes. These soils formed in moderately fine textured colluvium from igneous and metamorphic rock. The slopes are 25 to 65 percent and have some nearly vertical escarpments. The average annual air temperature is about 40 degrees F, and the average annual precipitation is about 16 inches.

These soils are loamy-skeletal, mixed Lithic Haploborolls.

Typical pedon of Comodore very stony loam, 25 to 65 percent slopes, about 4 1/2 miles southeast of Crestone, above old railroad grade, between abandoned mine and Cottonwood Creek in Baca Grande, T. 43 N., R. 12 E.

A1—0 to 5 inches; grayish brown (10YR 5/2) very stony loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, friable, nonsticky and nonplastic; about 25 percent stones; neutral; abrupt smooth boundary.

C—5 to 15 inches; pale brown (10YR 6/2) very stony loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; soft, friable, nonsticky and nonplastic; 60 percent stones; slightly acid to neutral; abrupt smooth boundary.

R—15 inches; hard igneous and metamorphic bedrock.

Depth to bedrock ranges from 10 to 20 inches. Clay content of the soil is 18 to 27 percent. Rock fragments make up 35 to 85 percent of the pedon and are mostly 10 to 36 inches in diameter.

Corlett Series

The Corlett series consists of deep, moderately well drained soils that formed on low dunes and low terraces on alluvial valley floors. These soils formed in alkaline eolian sand. The slope is 3 to 15 percent. The average

annual precipitation is about 7 inches, and the average air temperature is about 41 degrees F.

These soils are mixed, frigid Typic Torripsamments.

Typical pedon of Corlett fine sand, in an area of Corlett-Hooper complex, 0 to 15 percent slopes, about 1,500 feet north and 500 feet west of the SE corner of sec. 36, T. 43 N., R. 8 E.

A1—0 to 7 inches; pale brown (10YR 6/2) fine sand, brown (10YR 4/2) moist; single grained; loose, very friable, nonsticky and nonplastic; calcareous; strongly alkaline; clear wavy boundary.

C—7 to 60 inches; light brownish gray (10YR 6/2) fine sand, very dark grayish brown (10YR 4/2) moist; single grained; loose, very friable, nonsticky and nonplastic; calcareous; strongly alkaline.

Depth to the seasonal water table is 3.5 to 6.0 feet. Depth to calcareous material ranges from 0 to 10 inches, but continuous subhorizons of visible secondary calcium carbonate do not occur above a depth of 40 inches. Exchangeable sodium makes up 15 to 40 percent of most of the subhorizons of the control section. The 10- to 40- inch control section is a loamy sand, fine sand, or sand.

Costilla Series

The Costilla series consists of deep, somewhat excessively drained soils that are on fans and terraces on alluvial valley floors. These soils formed in sandy alluvium. The slope is 0 to 3 percent. The average annual precipitation is about 8 inches, and the average annual air temperature is about 41 degrees.

These soils are mixed, frigid Typic Torripsamments.

Typical pedon of Costilla gravelly loamy sand, 0 to 3 percent slopes, about 2,300 feet west and 350 feet south of the NE corner of sec. 19, T. 45 N., R. 10 E.

A11—0 to 10 inches; dark yellowish brown (10YR 4/4) gravelly loamy sand, dark brown (10YR 3/3) moist; weak medium and fine granular structure; slightly hard, very friable; 30 percent gravel; mildly alkaline; clear smooth boundary.

A12—10 to 14 inches; yellowish brown (10YR 5/4) gravelly loamy sand, dark yellowish brown (10YR 3/4) moist; massive; soft, very friable; 25 percent gravel; moderately alkaline; abrupt smooth boundary.

AC—14 to 18 inches; yellowish brown (10YR 5/4) gravelly loamy sand, dark yellowish brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; 25 percent gravel; calcareous; moderately alkaline; clear smooth boundary.

Cca—18 to 60 inches; light yellowish brown (10YR 6/4) gravelly loamy sand, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; 30 percent gravel; visible secondary calcium carbonate as thin streaks and blotches; calcareous; moderately alkaline.

Depth to calcareous material ranges from 10 to 40 inches. Depth to continuous subhorizons of visible secondary calcium carbonate ranges from 10 to 40 inches. The 10- to 40-inch control section is gravelly loamy sand or gravelly sand. The gravel content is 15 to 35 percent.

Cotopaxi Series

The Cotopaxi series consists of deep, somewhat excessively drained soils on alluvial valley floors. These soils formed as dunelike hills and ridges in eolian sands. The slope is 2 to 15 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are mixed, frigid Typic Torripsamments.

Typical pedon of Cotopaxi sand, 2 to 15 percent slopes, about 1,400 feet west and 300 feet north of the SE corner of sec. 34, T. 41 N., R. 11 E.

A1—0 to 7 inches; brown (10YR 5/3) sand, dark brown (10YR 3/3) moist; single grained; loose, nonsticky and nonplastic; mildly alkaline; gradual smooth boundary.

C—7 to 60 inches; pale brown (10YR 6/3) sand, brown (10YR 4/3) moist; single grained; loose, nonsticky and nonplastic; mildly alkaline.

Clay content in the 10- to 40-inch control section is 2 to 6 percent. Depth to continuous calcareous material is greater than 40 inches.

Crestvale Series

The Crestvale series consists of deep, somewhat poorly drained soils that are on fans and terraces, on alluvial valley floors. These soils formed in loamy, calcareous alluvium. The slope is 0 to 1 percent. The average annual precipitation is about 8 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy, mixed, frigid Cambic Gypsiorthids.

Typical pedon of Crestvale loam, 0 to 1 percent slopes, about 50 feet north and 1,750 feet west of the SE corner of sec. 12, T. 44 N., R. 9 E.

Alcssa—0 to 21 inches; very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; 12 percent calcium sulfate occurring as many fine and very fine crystals disseminated and in small spots; calcareous; moderately alkaline; gradual smooth boundary.

ACcssa—21 to 30 inches; very pale brown (10YR 7/3) heavy loam, brown (10YR 5/3) moist; weak medium subangular blocky structure that parts to weak fine granular; slightly hard, very friable, slightly sticky and slightly plastic; 2 percent calcium sulfate in common fine spots; calcareous; moderately alkaline; clear smooth boundary.

C1ca—30 to 42 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure that parts to weak fine subangular blocky; hard, friable, sticky and plastic; many fine pores; calcium carbonate visible in small spots and streaks; calcareous; moderately alkaline; clear smooth boundary.

C2—42 to 60 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and nonplastic; calcareous; moderately alkaline.

Depth to the seasonal water table is 2.5 to 3.5 feet. Calcium sulfate makes up 10 to about 20 percent of the salic horizon and is about 5 to 10 times more concentrated in that horizon than in the underlying C horizon. Soluble salts make up 2 to 8 percent of the salic horizon. Clay content in the control section ranges from 18 to 35 percent, and the content of sand coarser than very fine sand ranges from 30 to 50 percent.

Decross Series

The Decross series consists of deep, well drained soils on valley side slopes, fans, and terraces. These soils formed in calcareous alluvium. The slope is 1 to 15 percent. The average annual precipitation is about 18 inches, and the average annual air temperature is about 37 degrees F.

These soils are fine-loamy, mixed Argic Pachic Cryoborolls.

Typical pedon of Decross loam, 1 to 15 percent slopes, about 70 feet north and 190 feet east of the Forest Service gate in sec. 33, T. 46 N., R. 8 E.

A1—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; hard, friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

B21t—6 to 11 inches; brown (7.5YR 5/2) clay loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure that parts to moderate medium granular; hard, friable, sticky and plastic; thin patchy clay films on faces of peds; 10 percent gravel; mildly alkaline; clear smooth boundary.

B22t—11 to 22 inches; brown (7.5YR 5/2) clay loam, dark brown (7.5YR 3/2) moist; moderate coarse prismatic structure that parts to moderate medium subangular blocky; hard, friable, sticky and plastic; thin nearly continuous clay films on faces of peds; 10 percent gravel; mildly alkaline; clear smooth boundary.

B3ca—22 to 30 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; weak coarse prismatic structure that parts to moderate medium subangular blocky; hard, friable, sticky and plastic; 10 percent gravel; visible seams and mycelia of secondary carbonates; calcareous; moderately alkaline; clear smooth boundary.

Cca—30 to 60 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; massive; hard, friable, sticky and plastic; visible seams and soft masses of secondary carbonates; calcareous; 15 percent calcium carbonate; moderately alkaline.

Depth to calcareous material is 15 to 40 inches, and the calcium carbonate equivalent is 15 to 25 percent. Thickness of the mollic epipedon ranges from 16 to 36 inches. The B2t horizons are typically heavy loam or clay loam. Rock fragments, mainly pebbles, make up 0 to 15 percent of the volume.

Derrick Series

The Derrick series consists of deep, well drained soils that are on fans and terraces on alluvial valley floors. These soils formed in medium textured gravelly alluvium. The slope is 0 to 3 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are loamy-skeletal, mixed, frigid Typic Haplargids.

Typical pedon of Derrick very gravelly loam, 0 to 3 percent slopes, 2,040 feet south and 30 feet west of the NE corner of sec. 36, T. 41 N., R. 6 E.

A1—0 to 4 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; weak fine and medium granular structure; slightly hard, friable, nonsticky and nonplastic; 35 percent gravel; mildly alkaline; clear smooth boundary.

B2t—4 to 11 inches; yellowish brown (10YR 5/4) very gravelly sandy clay loam, dark yellowish brown (10YR 3/4) moist; weak medium subangular blocky structure that parts to moderate fine granular; hard, friable, slightly sticky and plastic; thin patchy clay films on peds and coating gravel; 50 percent gravel, mostly basalt; mildly alkaline; clear smooth boundary.

B3ca—11 to 13 inches; yellowish brown (10YR 5/4) very gravelly heavy sandy loam, dark yellowish brown (10YR 3/4) moist; weak fine subangular blocky structure that parts to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; 45 percent gravel and 15 percent cobblestones; visible calcium carbonate occurring as concretions, in thin

seams, and as coatings on the bottom of pebbles; calcareous; moderately alkaline; clear smooth boundary.

IICca—13 to 60 inches; extremely gravelly sand; some visible carbonates coating rock fragments; calcareous; moderately alkaline.

Depth to the calcareous material ranges from 6 to 20 inches. Depth to the IIC horizon and depth to the base of the argillic horizon range from 11 to 20 inches. Rock fragments are mainly 1/2 inch to 10 inches in diameter.

Des Moines Series

The Des Moines series consists of deep, well drained soils that are on fans on alluvial valley floors. These soils formed in alluvium. The slope is 0 to 2 percent. The average annual precipitation is about 12 inches, and the average annual air temperature is about 41 degrees F.

These soils are clayey-skeletal, montmorillonitic Pachic Argiborolls.

Typical pedon of Des Moines gravelly clay loam, 0 to 2 percent slopes, about 1,700 feet east and 100 feet south of the NW corner of sec. 29, T. 42 N., R. 7 E.

A1—0 to 6 inches; gray (10YR 5/1) gravelly clay loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, friable, sticky and plastic; 15 percent gravel and 10 percent cobblestones; mildly alkaline; clear smooth boundary.

B21t—6 to 12 inches; gray (10YR 5/1) very gravelly heavy silty clay loam, very dark gray (10YR 3/1) moist; moderate fine subangular blocky structure; hard, friable, sticky and plastic; 25 percent gravel and 10 percent cobblestones; mildly alkaline; clear smooth boundary.

B22t—12 to 17 inches; gray (10YR 5/1) very gravelly heavy sandy clay loam, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; very hard, friable, sticky and slightly plastic; 40 percent gravel and 10 percent cobblestones; mildly alkaline; clear wavy boundary.

C1—17 to 25 inches; light brownish gray (10YR 6/2) very cobbly sandy clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, nonsticky and nonplastic; 30 percent gravel and 20 percent cobblestones; mildly alkaline; gradual wavy boundary.

C2—25 to 60 inches; light brownish gray (10YR 6/2) extremely cobbly sandy clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, sticky and slightly plastic; 25 percent gravel and 50 percent cobblestones; mildly alkaline.

The B21t horizon is a silty clay or clay loam that is 35 to 50 percent rock fragments. The B22t horizon is 35 to 50 percent rock fragments. The IIC horizon contains 25 to 60 percent gravel and 10 to 50 percent cobblestones. Thin, nearly continuous clay films are in the B horizon.

The Des Moines soils in Saguache County Area are slightly drier than the soils of the Des Moines series, and therefore, they are taxadjuncts to the series. For Des Moines soils in the survey area, the average annual precipitation is about 12 inches; but for the series, it is about 20 inches.

Dunul Series

The Dunul series consists of deep, somewhat excessively drained soils that are on fans and terraces on alluvial valley floors. These soils formed in very gravelly alluvium. The slope is 0 to 1 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are sandy-skeletal, mixed, frigid Typic Torriorthents.

Typical pedon of Dunul very gravelly sandy loam, about 250 feet north and 50 feet west of the SE corner of sec. 35, T. 41 N., R. 7 E.

Ap—0 to 6 inches; brown (10YR 5/3) very gravelly sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; 50 percent gravel, 10 percent cobblestones; calcareous; moderately alkaline; clear smooth boundary.

C1ca—6 to 14 inches; pale brown (10YR 6/3) very gravelly sand, brown (10YR 4/3) moist; many distinct (10YR 8/4) coatings, and disseminated calcium carbonate; massive; loose, nonsticky and nonplastic; about 45 percent gravel, 15 percent cobblestones; calcareous; moderately alkaline; clear smooth boundary.

C1—14 to 60 inches; pale brown very gravelly sand; about 45 percent gravel and 15 percent cobblestones.

Depth to calcareous material and depth to the Cca horizon range from 4 to 10 inches. Rock fragments make up 35 to 75 percent of the soil profile.

Garita Series

The Garita series consists of deep, well drained soils on fans and foot slopes. These soils formed in calcareous gravelly alluvium derived mainly from basalt. The slope is 0 to 35 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are loamy-skeletal, mixed, frigid Typic Calciorthids.

Typical pedon of Garita gravelly loam, 0 to 3 percent slopes, about 2,100 feet south and 1,200 feet west of the NE corner of sec. 3, T. 46 N., R. 9 E.

A1—0 to 3 inches; brown (10YR 4/3) gravelly loam, dark brown (10YR 3/3) moist; weak coarse granular structure that parts to moderate fine granular; soft, friable, nonsticky and nonplastic; about 25 percent gravel; moderately alkaline; abrupt smooth boundary.

C1ca—3 to 9 inches; brown (10YR 5/3) gravelly loam, brown (10YR 4/3) moist; weak medium subangular blocky structure that parts to weak fine granular; slightly hard, friable, nonsticky and nonplastic; about 30 percent gravel; visible calcium carbonate occurring as concretions, in seams, and as coatings on rock fragments; calcareous; moderately alkaline; clear smooth boundary.

C2ca—9 to 21 inches; white (10YR 8/2) very gravelly loam, very pale brown (10YR 7/3) moist; massive; hard, friable, nonsticky and nonplastic; about 40 percent gravel; calcium carbonate visible as finely divided forms and as thick coatings on rock fragments; calcareous; moderately alkaline; clear smooth boundary.

C3ca—21 to 60 inches; very pale brown (10YR 7/4) very gravelly loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; about 55 percent gravel; calcium carbonate visible as seams and coatings on rock fragments; calcareous; moderately alkaline.

Depth to calcareous material ranges from 0 to 5 inches, and depth to concentrated layers of calcium carbonate accumulation (calcic horizon) ranges from 5 to 40 inches. Clay content averages 10 to 20 percent throughout the control section. Rock fragments make up 35 to 75 percent of the control section and are predominantly less than 10 inches in diameter. The steeper soils normally have larger amounts of gravel and cobblestones in the profile than do the more gently sloping soils.

Gelkie Series

The Gelkie series consists of deep, well drained soils on toe slopes and mountain side slopes. These soils formed in colluvium from igneous rock. The slope is 3 to 25 percent. The average annual precipitation is about 17 inches, and the average annual air temperature is about 36 degrees F.

These soils are fine-loamy, mixed Argic Cryoborolls.

Typical pedon of Gelkie loam, in an area of Bushvalley-Gelkie-Rock outcrop complex, 3 to 65 percent slopes, on the north side of the road; about 1,850 feet west and 2,000 feet south of the NE corner of sec. 13, T. 42 N., R. 5 E.

A1—0 to 4 inches; grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate medium and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; neutral; gradual smooth boundary.

A3—4 to 13 inches; grayish brown (10YR 5/2) light clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; 10 percent cobblestones; mildly alkaline; clear smooth boundary.

B2t—13 to 24 inches; brown (10YR 5/3) gravelly clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few thin clay films in root channels and bridging on sand grains; 15 percent gravel; mildly alkaline; clear smooth boundary.

C1ca—24 to 42 inches; pale brown (10YR 6/3) gravelly loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; calcareous with a few spots of lime; 20 percent gravel, 5 percent cobblestones; moderately alkaline; gradual smooth boundary.

C2—42 to 60 inches; pale brown (10YR 6/3) very gravelly loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; calcareous; 35 percent gravel and 10 percent cobblestones; moderately alkaline.

Depth to uniformly calcareous material ranges from 20 to 30 inches. Rock fragments, mainly 1/2 inch to 3 inches in size, make up 0 to 30 percent of the control section. In some pedons the calcium carbonate equivalent in the lower subhorizons ranges from 4 to 10 percent.

Gerrard Series

In the Gerrard series are deep, poorly drained soils that are on terraces, fans, and flood plains on alluvial valley floors. These soils formed in alluvium. The slope is 0 to 3 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy over sandy or sandy-skeletal, mixed, frigid Typic Haplaquolls.

Typical pedon of Gerrard loam, 0 to 3 percent slopes, about 2,200 feet west and 400 feet north of the SE corner of sec. 27, T. 47 N., R. 9 E.

A11—0 to 4 inches; dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; weak coarse platy structure that parts to weak fine subangular blocky; slightly hard, friable, slightly sticky and plastic; common very fine roots; mildly alkaline; clear smooth boundary.

A12—4 to 8 inches; very dark grayish brown (10YR 3/2) gravelly clay loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; slightly

hard, friable, slightly sticky and slightly plastic; 15 percent gravel; neutral; clear smooth boundary.

B2g—8 to 12 inches; grayish brown (10YR 5/2) gravelly sandy clay loam, dark brown (10YR 3/2) moist; common medium distinct yellowish brown (10YR 5/4) mottles; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; 20 percent gravel, 10 percent cobblestones; neutral; clear smooth boundary.

IIC2—12 to 60 inches; variegated but mainly light brown very gravelly loamy sand; 30 percent gravel, 10 percent cobblestones; neutral.

Depth to the seasonal water table is 1.0 to 1.5 feet. Depth to the IIC horizon ranges from 12 to 20 inches. The upper part of the control section is 20 to 35 percent clay. Hue ranges from 5Y through 7.5YR. Mottling ranges from distinct to prominent.

Graypoint Series

The Graypoint series consists of deep, well drained soils on broad fans and terraces on alluvial valley floors. These soils formed in alluvium derived principally from basalt. The slope is 0 to 3 percent. The average annual precipitation is about 8 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy over sandy or sandy-skeletal, mixed, frigid Typic Haplargids.

Typical pedon of Graypoint gravelly sandy loam, 0 to 3 percent slopes, about 150 feet south and 1,750 feet west of the NE corner of sec. 32, T. 42 N., R. 7 E.

A1—0 to 4 inches; grayish brown (10YR 5/2) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse platy structure that parts to weak fine granular; soft, very friable, nonsticky and nonplastic; about 20 percent gravel; mildly alkaline; clear smooth boundary.

B2t—4 to 10 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure that parts to moderate medium subangular blocky; hard, friable, sticky and plastic; thin nearly continuous clay films on ped faces; about 10 percent gravel; mildly alkaline; clear smooth boundary.

B3ca—10 to 13 inches; light brownish gray (10YR 6/2) gravelly sandy clay loam, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure; hard, friable, sticky and slightly plastic; thin patchy clay films on ped faces and coating pebbles; 25 percent gravel; calcium carbonate coating bottom of pebbles; calcareous; mildly alkaline; clear smooth boundary.

C1ca—13 to 16 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; visible calcium carbonate in seams and streaks and coating bottom of pebbles; 30 percent gravel and 10 percent cobblestones; calcareous; moderately alkaline; clear smooth boundary.

IIC—16 to 60 inches; light gray (10YR 7/2) very gravelly sand, rock fragments are mostly basalt, light brownish gray (10YR 6/2) moist; single grained; loose, nonsticky and nonplastic; calcareous spots in upper part; moderately alkaline.

Depth to calcareous material ranges from 6 to 20 inches. As much as 10 to 35 percent of the major part of the solum is rock fragments. Clay content in the argillic horizon ranges from 20 to 35 percent.

Gunbarrel Series

The Gunbarrel series consists of deep, somewhat poorly drained and poorly drained soils on terraces and low fans on alluvial valley floors. These soils formed in alluvium. The slope is 0 to 1 percent. The average annual precipitation is about 8 inches, and the average annual air temperature is about 41 degrees F.

These soils are mixed, frigid Typic Psammaquents.

Typical pedon of Gunbarrel loamy sand, about 1,860 feet east and 25 feet north of the SW corner of sec. 20, T. 41 N., R. 10 E.

A1—0 to 5 inches; grayish brown (10YR 5/2) loamy sand, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; moderately alkaline; clear smooth boundary.

C1—5 to 23 inches; brown (10YR 5/3) loamy sand, dark yellowish brown (10YR 3/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; calcareous; strongly alkaline; clear smooth boundary.

C2g—23 to 28 inches; light gray (10YR 6/1) loamy sand, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; calcareous; strongly alkaline; clear smooth boundary.

C3—28 to 60 inches; variegated brown and gray coarse sands; massive; soft, loose, nonsticky and nonplastic; moderately alkaline.

Depth to the seasonal water table is 1.5 to 2.0 feet unless the soil is drained. Depth to calcareous material ranges from 0 to 20 inches. Coarse fragments make up 0 to 15 percent of the control section.

In the A1 and C horizons, hue ranges from 5Y through 7.5YR. The texture of the C horizon ranges from loamy sand to sand.

Hagga Series

The Hagga series consists of deep, poorly drained soils on low-lying flood plains on alluvial valley floors.

These soils formed in calcareous alluvium. The slope is 0 to 1 percent. The average annual precipitation is about 8 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy, mixed (calcareous), frigid Typic Fluvaquents.

Typical pedon of Hagga loam, dry, about 1,300 feet south and 10 feet east of the NW corner of sec. 4, T. 43 N., R. 10 E.

A11—0 to 7 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak fine granular structure that parts to weak medium subangular blocky; slightly hard, friable, sticky and plastic; calcareous; moderately alkaline; gradual smooth boundary.

A12—7 to 12 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure that parts to weak fine subangular blocky; slightly hard, very friable, sticky and plastic; calcareous; moderately alkaline; clear smooth boundary.

A13—12 to 20 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate fine granular structure that parts to weak fine subangular blocky; slightly hard, very friable, sticky and plastic; common fine and very fine roots; calcareous; moderately alkaline; clear smooth boundary.

A14—20 to 32 inches; light gray (10YR 7/2) clay loam, grayish brown (10YR 5/2) moist; few fine faint yellowish brown (10YR 5/6) moist, mottles; moderate fine granular structure; slightly hard, very friable, sticky and plastic; calcareous; moderately alkaline; clear smooth boundary.

C1—32 to 40 inches; gray (10YR 6/1) clay loam, very dark gray (10YR 3/1) moist; common fine faint yellowish brown (10YR 5/6) moist, mottles; massive; hard, friable, sticky and plastic; common fine pores; calcareous; moderately alkaline; gradual smooth boundary.

A1bg—40 to 51 inches; very dark grayish brown (10YR 3/2) sandy clay loam, black (10YR 2/1) moist; few medium faint yellowish brown (10YR 5/6) moist, mottles; massive; hard, friable, sticky and plastic; common fine continuous pores; calcareous; moderately alkaline; clear smooth boundary.

C2g—51 to 60 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; common medium distinct yellowish brown (10YR 5/8) mottles; massive; hard, friable; calcareous; moderately alkaline.

Depth to the seasonal water table is 0.5 to 1.0 foot. Hue ranges from 10YR through 2.5Y. Clay content ranges from 18 to 35 percent. Mottling ranges from faint to prominent. These soils are calcareous throughout.

The Hagga soils in Saguache County Area are slightly drier than the soils of the Hagga series, and therefore, they are taxadjuncts to the series. For Hagga soils in the survey area, the average annual precipitation is about 8 inches; but for the Hagga series, the precipitation is about 18 inches.

Hapney Series

The Hapney series consists of deep, moderately well drained soils on flood plains, terraces, and fans on alluvial valley floors. These soils formed in alluvium. The slope is 0 to 1 percent. The average annual precipitation is about 8 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine, montmorillonitic Aridic Natriborolls.

Typical pedon of Hapney clay loam, about 600 feet east and 100 feet north of the SW corner of sec. 34, T. 45 N., R. 9 E.

A2—0 to 2 inches; light gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate very coarse platy structure that parts to moderate fine subangular blocky; slightly hard, friable, sticky and plastic; calcareous; strongly alkaline; abrupt smooth boundary.

B2t—2 to 20 inches; gray (10YR 5/1) heavy clay loam, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure that parts to moderate very fine granular; slightly hard, friable, sticky and plastic; calcareous; strongly alkaline; clear smooth boundary.

B3—20 to 26 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine subangular blocky structure; hard, firm, sticky and plastic; calcareous; moderately alkaline; clear smooth boundary.

C1—26 to 34 inches; light brownish gray (2.5Y 6/2) clay, olive brown (2.5Y 4/4) moist; common fine yellowish brown and brown mottles; (10YR 5/6) massive; hard, firm, sticky and plastic; moderately alkaline; clear smooth boundary.

C2g—34 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; moderately alkaline.

Depth to the seasonal high water table is 4.0 to 5.0 feet. Hue ranges from 2.5Y through 7.5YR. The content of exchangeable sodium ranges from 15 to 40 percent in the B2t horizon.

Harlem Series

The Harlem series consists of deep, moderately well drained, slowly permeable soils on flood plains and low terraces on alluvial valley floors. These soils formed in calcareous clayey alluvium. The slope is 0 to 1 percent.

The average annual precipitation is about 8 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine, montmorillonitic (calcareous), frigid Ustic Torrifluvents.

Typical profile of Harlem clay, in an area of Harlem, dry-Slickspots complex, about 2,400 feet south and 25 feet east of the NW corner of sec. 12, T. 44 N., R. 9 E.

A1—0 to 9 inches; light brownish gray (10YR 6/2) clay, brown (10YR 5/3) moist; moderate medium prismatic structure that parts to strong medium subangular blocky; very hard, friable, very sticky and very plastic; calcareous; moderately alkaline; clear smooth boundary.

AC—9 to 13 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; weak medium prismatic structure that parts to weak fine subangular blocky; very hard, firm, very sticky and very plastic; calcareous; strongly alkaline; clear smooth boundary.

C—13 to 21 inches; light gray (10YR 7/2) clay, brown (10YR 5/3) moist; moderate fine granular structure; slightly hard, firm, very sticky and very plastic; calcareous; strongly alkaline; abrupt smooth boundary.

A1b—21 to 29 inches; gray (10YR 5/1) clay, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; hard, friable, very sticky and very plastic; calcareous; moderately alkaline; abrupt smooth boundary.

IIC1—29 to 40 inches; pale brown (10YR 6/3) heavy clay loam, brown (10YR 5/3) moist; common medium distinct yellowish red (5YR 5/6) and fine medium distinct (7.5YR 5/6) mottles; massive; very hard, firm, very sticky and very plastic; 10 percent fine gravel; calcareous; moderately alkaline; clear wavy boundary.

IIC2—40 to 52 inches; light yellowish brown (10YR 6/4) heavy clay loam, dark yellowish brown (10YR 4/4) moist; fine medium distinct strong brown (7.5YR 5/6) mottles; many medium prominent black (10YR 2/1) spots; massive; hard, friable, very sticky and very plastic; calcareous; moderately alkaline; gradual wavy boundary.

C3g—52 to 60 inches; light olive gray (5Y 6/2) sandy clay loam, gray (5Y 6/1) moist; massive; hard, friable, sticky and plastic; many large prominent yellowish brown (10YR 5/6) mottles; calcareous in spots; moderately alkaline.

Depth to the seasonal water table is 3.5 to 5.0 feet. The clay content ranges from 35 to 55 percent in the control section. Depth to buried layers ranges from 18 to 40 inches. Depth to calcareous material ranges from 0 to 12 inches. Rock fragments make up 0 to 10 percent of the pedon.

The Harlem soils in Saguache County Area are slightly drier than the soils of the Harlem series, and therefore, they are taxadjuncts to the series. For Harlem soils in the survey area, the average annual precipitation is about 8 inches; but for the series, the precipitation is about 15 inches.

Hooper Series

The Hooper series consists of deep, moderately well drained, alkaline soils on flood plains and fans on alluvial valley floors. These soils formed in alluvium derived principally from basalt. The slope is 0 to 3 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are clayey over sandy or sandy-skeletal, montmorillonitic, frigid Typic Natrargids.

Typical pedon of Hooper clay loam, 500 feet west and 200 feet south of the NE corner of sec. 20, T. 42 N., R. 9 E.

A2—0 to 4 inches; light gray (10YR 7/2) clay loam, brown (10YR 5/3) moist; weak medium platy structure that parts to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; many fine vesicular pores; very strongly alkaline; clear smooth boundary.

B1—4 to 10 inches; light gray (10YR 7/2) clay loam, yellowish brown (10YR 5/4) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; very strongly alkaline; clear smooth boundary.

B21t—10 to 16 inches; pale brown (10YR 6/3) clay, yellowish brown (10YR 5/4) moist; moderate coarse prismatic structure that parts to moderate medium subangular blocky; very hard, firm, very sticky and very plastic; many moderately thick clay films on faces of peds; 10 percent gravel; very strongly alkaline; abrupt smooth boundary.

B22t—16 to 23 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; weak coarse subangular blocky structure that parts to moderate fine subangular blocky; very hard, firm, very sticky and very plastic; many moderately thick clay films on faces of peds; 10 percent gravel; very strongly alkaline; gradual wavy boundary.

B3ca—23 to 30 inches; light gray (10YR 7/2) gravelly heavy clay loam, mixed colors of yellowish brown (10YR 5/6) and very pale brown (10YR 7/3) moist; weak medium subangular blocky structure; very hard, very firm, very sticky and very plastic; 20 percent fine gravel; many streaks and spots of secondary calcium carbonates; calcareous; very strongly alkaline; clear wavy boundary.

IIC1—30 to 60 inches; light gray (2.5Y 7/2) very gravelly sand, grayish brown (10YR 5/2) moist; single grained; loose, nonsticky and nonplastic; 40 percent gravel; strongly alkaline.

Depth to very gravelly sand is 20 to 40 inches. Depth to the water table ranges from 4 to more than 6 feet. Exchangeable sodium ranges from 15 to 60 percent in most subhorizons, but is less than 15 percent in the surface layer in some pedons. Clay content ranges from 35 to 55 percent above the IIC horizon. Depth to continuous subhorizons of visible secondary calcium carbonate, calcium sulfate, or other soluble salt accumulations ranges from 10 to 40 inches.

The A horizon is loamy sand or clay loam.

Hopkins Series

The Hopkins series consists of deep, well drained soils on mountain side slopes and ridges. These soils formed in colluvium from rhyolite and welded tuff. The slope is 3 to 35 percent. The average annual precipitation is about 15 inches, and the average annual air temperature is about 38 degrees F.

These soils are fine-loamy over fragmental, mixed Typic Cryoborolls.

Typical pedon of Hopkins channery loam, in an area of Hopkins-Cheadle-Rock outcrop complex, 3 to 35 percent slopes, about 1,200 feet south and 200 feet east of the NW corner of sec. 31, T. 46 N., R. 5 E.

A1—0 to 8 inches; brown (7.5YR 5/2) channery loam, dark brown (7.5YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and nonplastic; 25 percent flat tuff fragments 2 to 6 inches long and 0.5 inch to 6 inches across; mildly alkaline; clear wavy boundary.

C1—8 to 15 inches; brown (10YR 5/3) channery loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; about 30 percent flat tuff fragments, half of which are 6 to 10 inches across; mildly alkaline; clear wavy boundary.

C2—15 to 60 inches; overlapping flagstones of welded tuff, separated by voids 0.5 inch to 4 inches across, half of which are filled by soil material; the lower sides of flagstones have thin calcium carbonate coatings and pendants in the upper part of this horizon.

Thickness of the mollic epipedon ranges from 7 to 14 inches. Depth to calcareous material ranges from 6 to 20 inches, and depth to the fragmental C2 horizon ranges from 14 to 20 inches. Coatings of calcium carbonate occur on some rock fragments in the upper part of the C2 horizon. The A horizon contains from 15 to 35 percent rock fragments up to 10 inches in length. Rock fragments in the substratum make up 35 to 90 percent of the volume and are 6 to 15 inches in length.

Jodero Series

The Jodero series consists of deep, well drained soils on alluvial fans and stream terraces. These soils formed in alluvium. The slope is 0 to 6 percent. The average annual precipitation is about 12 inches, and the average annual air temperature is about 40 degrees F.

These soils are fine-loamy, mixed Cumulic Haploborolls.

Typical pedon of a Jodero loam, in an area of Jodero-Lolo, wet complex, 0 to 6 percent slopes, about 850 feet south and 100 feet east of the NW corner of sec. 26, T. 45 N., R. 8 E.

A11—0 to 6 inches; dark brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and nonplastic; neutral; gradual smooth boundary.

A12—6 to 11 inches; dark brown (10YR 4/3) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure that parts to weak fine granular; hard, very friable, sticky and plastic; mildly alkaline; clear smooth boundary.

A13—11 to 24 inches; dark grayish brown (10YR 4/3) sandy clay loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; mildly alkaline; clear smooth boundary.

ACca—24 to 40 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; common medium distinct yellowish red (5YR 4/6) and dark reddish brown (5YR 3/4) mottles; massive; hard, friable, slightly sticky and slightly plastic; many thin threads of lime; few continuous, thin (1/2 to 1 inch) lenses of sand; calcareous; moderately alkaline; clear smooth boundary.

C2—40 to 48 inches; grayish brown (10YR 5/2) loamy sand, very dark grayish brown (10YR 3/2) moist; common medium distinct brownish yellow (10YR 6/6) mottles; single grained; loose, nonsticky and nonplastic; calcareous; moderately alkaline; clear smooth boundary.

C3—48 to 60 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; common medium distinct yellowish brown (10YR 5/4 and 5/8) mottles; massive; hard, friable, slightly sticky and plastic; mildly alkaline.

The mollic epipedon ranges from 40 to more than 60 inches in thickness. Depth to calcareous material ranges from 10 to 40 inches. Clay content of the control section ranges from 18 to 25 percent. The content of rock fragments ranges from 0 to 15 percent and are 1/2 inch to 10 inches in diameter. Hue ranges from 5Y through 7.5YR.

Kerber Series

The Kerber series consists of deep, somewhat poorly drained alkali soils that are on terraces and in depressions on alluvial valley floors. These soils formed in alluvium from igneous rocks. The slope is 0 to 1 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are coarse-loamy, mixed, frigid Aquic Natrargids.

Typical pedon of Kerber loamy sand, about 1,000 feet north and 100 feet east of the SW corner of sec. 9, T. 41 N., R. 10 E.

A21—0 to 2 inches; light gray (10YR 7/2) loamy sand, grayish brown (10YR 5/2) moist; weak medium platy structure that parts to weak fine granular; soft, very friable, nonsticky and nonplastic; common fine roots; calcareous; strongly alkaline; abrupt smooth boundary.

A22—2 to 8 inches; light brownish gray (10YR 6/2) loamy sand, dark grayish brown (10YR 4/2) moist; weak fine platy structure that parts to weak fine granular; soft, very friable, nonsticky and nonplastic; common fine roots; calcareous; strongly alkaline; clear smooth boundary.

B2t—8 to 16 inches; light brown (7.5YR 6/4) heavy sandy loam, brown (7.5YR 4/4) moist; weak coarse columnar structure that parts to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few very thin clay films on sand grains and ped faces; calcareous; very strongly alkaline; clear smooth boundary.

B3ca—16 to 20 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; calcareous, with small spots of visible calcium carbonate; very strongly alkaline; clear smooth boundary.

C1ca—20 to 27 inches; light gray (10YR 7/2) sandy loam, light brownish gray (10YR 6/2) moist; common fine distinct light brownish gray (2.5Y 6/2) moist mottles; massive; slightly hard, very friable, nonsticky and nonplastic; disseminated visible calcium carbonate; calcareous, strongly alkaline; clear smooth boundary.

IIC2—27 to 60 inches; pale brown (10YR 6/3) sand, brown (10YR 5/3) moist; common fine distinct light brownish gray (2.5Y 6/2) moist mottles; single grained; loose, nonsticky; about 10 percent pebbles; calcareous; moderately alkaline.

Exchangeable sodium ranges from 15 to 50 percent in the B horizon and a majority of the subhorizons but is less than 15 percent in the A1 and A2 horizons in some pedons. Depth to uniformly calcareous material ranges from 0 to 12 inches. Depth to the base of the argillic horizon ranges from 10 to 40 inches. Depth to continuous subhorizons of secondary calcium carbonate, calcium sulfate, or other soluble salt accumulations ranges from 10 to 40 inches. Rock fragments make up 0 to 35 percent of the IIC horizon and are dominantly 1/2 inch to 3 inches in diameter. Mottling is common in the lower part of the solum and in the C horizon and is faint to distinct. Depth to the water table ranges from 2 to 3 feet during spring and summer.

Laney Series

The Laney series consists of deep, well drained, saline-alkali affected soils that occur on flood plains and fans on alluvial valley floors. These soils formed in calcareous alluvium. The slope is 0 to 3 percent. The average annual precipitation is about 8 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy, mixed (calcareous), frigid Typic Torrifluvents.

Typical pedon of Laney loam, 0 to 3 percent slopes, about 200 feet east of the NW corner of sec. 13, T. 44 N., R. 8 E.

A11—0 to 4 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few fine and common very fine roots; calcareous; strongly alkaline; abrupt smooth boundary.

A12—4 to 8 inches; light brownish gray (10YR 6/2) loam, dark brown (10YR 3/3) moist; moderate coarse platy structure that parts to moderate fine subangular blocky; slightly hard, friable; slightly sticky and nonplastic; calcareous; strongly alkaline; clear smooth boundary.

C1—8 to 17 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; calcareous; very strongly alkaline; clear smooth boundary.

C2ca—17 to 43 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine lime masses; calcareous; strongly alkaline; clear smooth boundary.

C3—43 to 50 inches; brown (10YR 4/3) clay loam, strata of dark brown (10YR 3/3) and very dark grayish brown (10YR 3/2); massive; slightly hard, friable, slightly sticky and slightly plastic; calcareous; moderately alkaline; abrupt smooth boundary.

IIC4—50 to 60 inches; light brownish gray (10YR 6/2) loamy coarse sand, thin strata of dark brown (10YR 3/3) and very dark grayish brown (10YR 3/2); massive; loose, nonsticky and nonplastic; moderately alkaline.

Depth to calcareous material ranges from 0 to 10 inches. Content of exchangeable sodium ranges from 15 to 50 percent. Hue ranges from 7.5YR to 10YR. The A horizon is strongly alkaline to very strongly alkaline. The C horizon is strongly alkaline to very strongly alkaline above a depth of 40 inches.

Lolo Series

The Lolo series consists of deep, moderately well drained soils on terraces adjacent to drainageways. These soils formed in alluvium. The slope is 0 to 6 percent. The average annual precipitation is about 12 inches, and the average annual air temperature is about 40 degrees F.

These soils are loamy-skeletal, mixed Pachic Haploborolls.

Typical pedon of Lolo gravelly sandy loam, in an area of Jodero-Lolo, wet complex, 0 to 6 percent slopes, about 1,700 feet east and 1,900 feet south of the NW corner of sec. 17, T. 44 N., R. 11 E.

A11—0 to 8 inches; dark grayish brown (10YR 4/2) gravelly sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; 20 percent gravel, 5 percent cobblestones; mildly alkaline; gradual smooth boundary.

A12—8 to 25 inches; brown (7.5YR 4/2) very gravelly sandy loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; 30 percent gravel, 10 percent cobblestones; mildly alkaline; clear smooth boundary.

B2—25 to 37 inches; yellowish brown (10YR 5/4) very cobbly sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, very friable, slightly sticky and nonplastic; 10 percent gravel, 40 percent cobblestones; mildly alkaline; gradual smooth boundary.

C1—37 to 60 inches; yellowish brown (10YR 5/4) extremely cobbly sandy loam, brown (7.5YR 4/4) moist; massive; hard, friable, nonsticky and nonplastic; 10 percent gravel, 50 percent cobblestones, 5 percent stones; mildly alkaline.

The seasonal water table is at a depth of 1.5 to 2.5 feet. Reaction in the major part of the profile ranges from neutral to mildly alkaline. Calcium carbonate occurs as coatings on the undersides of pebbles and cobblestones in some pedons. Rock fragments make up 35 to 70 percent of the pedon and are mainly 1/4 inch to 10 inches in diameter. The mollic epipedon ranges from 16 to 26 inches in thickness. Hue ranges from 10YR through 2.5Y.

The Lolo soils in Saguache County Area are slightly drier than the soils of the Lolo series, and therefore, they are taxadjuncts to the series. For Lolo soils in the survey area, the average annual precipitation is about 12 inches; but for the series, it is about 19 inches.

Luhon Series

The Luhon series consists of deep, well drained soils on fans and valley side slopes on alluvial valley floors. These soils formed in calcareous alluvium. The slope is 0 to 6 percent. The average annual precipitation is about 10 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy, mixed Borollic Calciorthids.

Typical pedon of Luhon loam, 0 to 3 percent slopes, about 2,170 feet west and 300 feet north of the SE corner of sec. 14, T. 41 N., R. 6 E.

A1—0 to 7 inches; brown (10YR 5/3) loam, dark yellowish brown (10YR 3/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; weak fine to common very fine roots; calcareous; moderately alkaline; clear smooth boundary.

C1ca—7 to 20 inches; light gray (10YR 7/2) loam, brown (10YR 4/3) moist; weak moderate subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; visible secondary calcium carbonate accumulations; calcareous; moderately alkaline; clear smooth boundary.

C2ca—20 to 60 inches; pinkish white (7.5YR 8/2) light loam, pinkish gray (7.5YR 6/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; calcium carbonate visible in finely divided forms; moderately alkaline.

The content of rock fragments is 0 to 35 percent. The fragments are mainly 1/4 inch to 3 inches in diameter. Depth to uniformly calcareous material ranges from 0 to 8 inches. The depth to the calcic horizon ranges from 5 to 30 inches. Calcium carbonate equivalent of the C2ca horizon is 15 to 30 percent. The soil material above the calcic horizon is moderately or strongly alkaline, and subhorizons of the calcic horizon are very strongly alkaline in some pedons. Clay content of the control section ranges from 18 to 35 percent.

McGinty Series

The McGinty series consists of deep, moderately well drained soils that are on fans on alluvial valley floors. These soils formed in calcareous alluvium derived dominantly from igneous rock. The slope is 0 to 3 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are coarse-loamy, mixed, frigid Typic Calciorthids.

Typical pedon of McGinty sandy loam, 0 to 3 percent slopes, about 1,250 feet north and 50 feet west of the SE corner of sec. 32, T. 41 N., R. 10 E.

Ap—0 to 8 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; calcareous; moderately alkaline; abrupt smooth boundary.

AC—8 to 17 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; calcareous; about 5 percent gravel; moderately alkaline; clear wavy boundary.

C1ca—17 to 30 inches; very pale brown (10YR 8/3) sandy loam, pale brown (10YR 6/3) moist; massive; hard, friable, slightly sticky and slightly plastic; visible calcium carbonate occurring as soft masses in seams and streaks and as coatings on sand grains; calcareous; moderately alkaline; clear smooth boundary.

C2ca—30 to 60 inches; pale brown (10YR 6/3) fine sandy loam and sandy loam stratified in thin layers, brown (10YR 5/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; visible calcium carbonate in seams and streaks, but less than in the C1ca horizon; calcareous; moderately alkaline.

Depth to the seasonal water table is 4.5 to 5.0 feet. Depth to uniformly calcareous material ranges from 0 to 18 inches. Depth to the calcic horizon ranges from 10 to 40 inches. The content of exchangeable sodium ranges from 0 to 15 percent in a major part of the control section. The control section in most pedons is sandy loam containing 10 to 18 percent clay. The content of rock fragments ranges from 0 to 15 percent. The fragments are mainly 0.5 inch to 3 inches in diameter. The Cca horizon ranges from moderately alkaline to very strongly alkaline and is 15 to 40 percent calcium carbonate.

Medano Series

The Medano series consists of deep, poorly drained soils on flood plains and lower ends of alluvial fans on alluvial valley floors. These soils formed in sandy alluvium. The slope is 0 to 1 percent. The average annual precipitation is about 9 inches, and the average annual air temperature is about 42 degrees F.

These soils are sandy, mixed, frigid Typic Haplaquolls.

Typical pedon of Medano fine sandy loam, in an unsectioned area of the San Luis Maria Baca Grant, about 800 feet south and 300 feet west of the SE corner of sec. 9, T. 43 N., R. 11 E.

A11—0 to 10 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine platy structure that parts to weak fine granular; slightly hard, very friable, nonsticky and nonplastic; calcareous; moderately alkaline; clear smooth boundary.

A12—10 to 19 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; few medium faint yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; calcareous; moderately alkaline; clear smooth boundary.

C1g—19 to 28 inches; light brownish gray (10YR 6/2) loamy fine sand, brown (10YR 4/3) moist; common medium distinct yellowish brown (10YR 5/8) mottles; massive; slightly hard, very friable, nonsticky and nonplastic; mildly alkaline; clear smooth boundary.

C2g—28 to 60 inches; brown (10YR 5/3) loamy fine sand, dark yellowish brown (10YR 3/4) moist; common medium prominent yellowish brown (10YR 5/8) mottles; single grained; slightly hard, very friable, nonsticky and nonplastic; mildly alkaline.

Depth to the seasonal water table is 1.5 to 3.0 feet. The soils are calcareous in the surface layer but are noncalcareous below a depth of 20 inches. The control section averages loamy fine sand or sand. Rock fragments make up 0 to 15 percent of a major part of the solum and are less than 3 inches in diameter.

Monte Series

The Monte series consists of deep, well drained soils on fans and flood plains on alluvial valley floors. These soils formed in calcareous alluvium, mainly from igneous rocks. The slope is 0 to 3 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy, mixed (calcareous), frigid Typic Torriorthents.

Typical pedon of Monte loam, 0 to 3 percent slopes, about 1,800 feet south and 400 feet west of the NE corner of sec. 33, T. 43 N., R. 7 E.

A1—0 to 12 inches; light brownish gray (10YR 6/2) loam, brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; calcareous; moderately alkaline; abrupt smooth boundary.

C1—12 to 20 inches; grayish brown (10YR 5/2) light clay loam, brown (10YR 4/2) moist; moderate medium subangular blocky structure that parts to moderate fine subangular blocky; slightly hard, friable, slightly sticky and plastic; calcareous; moderately alkaline; clear smooth boundary.

C2—20 to 60 inches; pale brown (10YR 6/3) stratified loam and sandy loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; calcareous; moderately alkaline.

Depth to calcareous material ranges from 0 to 10 inches. Rock fragments make up 0 to 15 percent of the pedon, and in many pedons they occur in thin stratified layers. The textural control section is 18 to 27 percent clay and 15 to 35 percent fine sand or coarser sand. Hue ranges from 5Y through 7.5YR.

Morval Series

The Morval series consists of deep, well drained soils on valley side slopes and fans. These soils formed in moderately fine textured alluvium, dominantly from igneous rock. The slope is 3 to 6 percent. The average annual precipitation is about 15 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy, mixed Aridic Argiborolls.

Typical pedon of Morval clay loam, 3 to 6 percent slopes, about 1,900 feet east and 1,500 feet north of the SW corner of sec. 19, T. 46 N., R. 9 E.

A1—0 to 5 inches; dark reddish gray (5YR 4/2) clay loam, dark reddish brown (5YR 3/2) moist; moderate fine subangular blocky structure that parts to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; mildly alkaline; abrupt smooth boundary.

B2t—5 to 12 inches; reddish gray (5YR 5/2) clay loam, dark reddish brown (5YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; thin patchy clay films on faces of peds and walls of pores; moderately alkaline; clear smooth boundary.

B3ca—12 to 27 inches; reddish brown (5YR 5/3) light clay loam, dark reddish gray (5YR 4/2) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, sticky and plastic; visible lime seams and spots; calcareous; moderately alkaline; clear smooth boundary.

C1ca—27 to 35 inches; light reddish brown (5YR 6/3) light clay loam, reddish brown (5YR 5/3) moist; massive; slightly hard, friable, sticky and plastic; visible lime seams; calcareous; moderately alkaline; clear smooth boundary.

C2ca—35 to 60 inches; brown (7.5YR 5/2) gravelly clay loam, dark brown (7.5YR 3/2) moist; massive; slightly hard, friable, sticky and plastic; 20 percent gravel; visible lime seams and spots; calcareous; moderately alkaline.

Rock fragments make up 5 to 25 percent of the solum and are mainly gravel and cobblestones 1/2 inch to 10 inches in diameter. Some pedons have discontinuous lenses or pockets of indurated calcium carbonate. The solum is 24 to 35 inches thick.

The Morval soils in Saguache County Area, which have hues redder than 7.5YR, are slightly drier than the soils of the Morval series, and therefore, are considered taxadjuncts to the series. For Morval soils in the survey area, the average annual precipitation is about 15 inches; but for the series, it is about 18 inches.

Mosca Series

The Mosca series consists of deep, well drained alkali soils on fans and flood plains on alluvial valley floors. These soils formed in alluvium from basalt. The slope is 0 to 3 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are coarse-loamy, mixed, frigid Typic Natrargids.

Typical pedon of Mosca loamy sand, 0 to 3 percent slopes, about 200 feet east and 50 feet north of the SW corner of sec. 31, T. 42 N., R. 59 E.

A11—0 to 4 inches; very pale brown (10YR 7/3) loamy sand, brown (10YR 4/3) moist; single grained; loose, nonsticky and nonplastic; calcareous; moderately alkaline; clear smooth boundary.

A12—4 to 8 inches; brown (7.5YR 4/2) loamy sand, dark brown (7.5YR 4/4) moist; single grained; loose, nonsticky and nonplastic; calcareous; moderately alkaline; clear smooth boundary.

B2t—8 to 14 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; calcareous; strongly alkaline; clear smooth boundary.

C1ca—14 to 32 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; calcium carbonate visible in seams and streaks; calcareous; moderately alkaline; clear smooth boundary.

IIC—32 to 60 inches; sand and very gravelly sand.

The content of exchangeable sodium ranges from 15 to 50 percent in the B horizon, and it is less than 15 percent in the surface layer of some pedons. Depth to the IIC horizon ranges from 20 to 40 inches. Rock fragments make up 0 to 15 percent of the soil above the IIC horizon and are dominantly less than 3 inches in diameter.

Mount Home Series

The Mount Home series consists of deep, well drained to somewhat excessively drained soils on fans. These soils formed in very cobbly and gravelly alluvium. The slope is 2 to 25 percent. The average annual precipitation is about 9 inches, and the average annual air temperature is about 43 degrees F.

These soils are loamy-skeletal, mixed (calcareous), frigid Typic Torriorthents.

Typical pedon of Mount Home very cobbly sandy loam, in an area of Mount Home-Saguache complex, 2

to 25 percent slopes, about 4,000 feet south of Spanish Creek, above old railroad grade on NE side of road, in an unsectioned area of T. 43 N., R. 12 E.

A1—0 to 16 inches; light brownish gray (10YR 6/2) very cobbly sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure that parts to single grained; soft, very friable, nonsticky and nonplastic; 10 percent gravel, 45 percent cobblestones; mildly alkaline; clear smooth boundary.

C1ca—16 to 36 inches; very pale brown (10YR 7/3) extremely cobbly sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; 75 percent cobblestones; visible secondary calcium carbonate occurring as concretions and coatings on the cobblestones; calcareous; moderately alkaline; gradual smooth boundary.

C2ca—36 to 60 inches; pale brown (10YR 6/3) extremely cobbly sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; 75 percent cobblestones; visible secondary calcium that forms concretions and coatings on the cobblestones less than in the C1ca horizon; calcareous; moderately alkaline.

Rock fragments make up 35 to 80 percent of the soil. Hue ranges from 2.5Y through 7.5YR. Depth to visible secondary calcium carbonate ranges from 12 to 40 inches. Clay content of the control section ranges from 8 to 18 percent.

Norte Series

The Norte series consists of deep, moderately well drained soils on terraces and fans on alluvial valley floors. These soils formed in calcareous, moderately coarse textured alluvium overlying beds of sand and gravel. The slope is 0 to 1 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are loamy-skeletal, mixed (calcareous), frigid Aquic Ustorthents.

Typical pedon of Norte gravelly sandy loam, 0 to 1 percent slopes, about 1,300 feet north and 150 feet east of the SW corner of sec. 17, T. 41 N., R. 8 E.

Ap—0 to 8 inches; brown (10YR 5/3) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak medium granular structure that parts to weak fine subangular blocky; soft, very friable, nonsticky and nonplastic; 15 percent gravel; calcareous; moderately alkaline; clear smooth boundary.

C1—8 to 26 inches; brown (10YR 5/3) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; 15 percent gravel, 5 percent cobblestones; calcareous; moderately alkaline; clear smooth boundary.

IIC2—26 to 60 inches; light brownish gray (10YR 6/2) very gravelly sand, dark grayish brown (10YR 4/2) moist; massive; loose, nonsticky and nonplastic; 35 percent gravel, 15 percent cobblestones; calcareous; moderately alkaline.

Depth to the seasonal water table is 2.5 to 4.0 feet. Depth to calcareous material ranges from 0 to 10 inches. Depth to the IIC horizon ranges from 24 to 40 inches. Clay content ranges from 2 to 18 percent in the textural control section. Hue ranges from 5Y through 7.5YR. Rock fragments make up 10 to 35 percent of the upper part of the control section.

Ouray Series

The Ouray series consists of deep, excessively drained soils on fans. These soils formed in alluvium from sand. The slope is 9 to 15 percent. The average annual precipitation is about 14 inches, and the average annual air temperature is about 40 degrees F.

These soils are sandy, mixed Torriorthentic Haploborolls.

Typical pedon of Ouray loamy sand, in an area of Ouray-Sabe complex, 9 to 25 percent slopes, about 3,600 feet north of Cottonwood Creek and 2,200 feet west of road on the old railroad grade; in unsectioned area of Baca Grande subdivision:

A11—0 to 6 inches; grayish brown (10YR 5/2) loamy sand, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure that parts to weak fine granular; soft, very friable; neutral; clear smooth boundary.

A12—6 to 13 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure that parts to weak fine granular; soft, very friable, nonsticky and nonplastic; neutral; clear smooth boundary.

AC—13 to 29 inches; yellowish brown (10YR 5/4) loamy sand, dark yellowish brown (10YR 3/4) moist; weak coarse subangular blocky structure that parts to weak fine granular; slightly hard, very friable, nonsticky and nonplastic; neutral; gradual wavy boundary.

C—29 to 72 inches; pale brown (10YR 6/3) loamy sand, dark yellowish brown (10YR 3/4) moist; single grained; loose, nonsticky and nonplastic; neutral.

Depth to uniformly calcareous material ranges from 40 to more than 60 inches.

Clay content averages 0 to 5 percent in the upper part of the control section. The content of rock fragments ranges from 0 to 15 percent of the volume. The fragments commonly are less than 3 inches in diameter.

Parlin Series

The Parlin series consists of deep, well drained soils on mountain side slopes and ridges. These soils formed in colluvium from rhyolitic tuff and rhyolite. The slope is 3 to 35 percent. The average annual precipitation is about 15 inches, and the average annual air temperature is about 41 degrees F.

These soils are clayey over loamy-skeletal, montmorillonitic Argic Cryoborolls.

Typical pedon of Parlin gravelly loam, 3 to 35 percent slopes, about 2,000 feet north and 1,800 feet east of the SW corner of sec. 21, T. 46 N., R. 5 E.

A1—0 to 8 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; 20 percent gravel; mildly alkaline; clear smooth boundary.

B2t—8 to 16 inches; light brown (7.5YR 6/4) gravelly heavy clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure that parts to moderate medium granular; hard, friable, sticky and plastic; moderately thick, patchy clay films on faces of peds; about 30 percent gravel; mildly alkaline; gradual smooth boundary.

B3ca—16 to 20 inches; light brown (7.5YR 6/4) extremely channery clay loam, dark brown (7.5YR 4/4) moist; moderate medium and fine granular structure; hard, friable, sticky and plastic; about 75 percent channery fragments and gravel; lime coatings and pendants on undersides of rocks; calcareous; moderately alkaline; clear smooth boundary.

IIC1ca—20 to 28 inches; light yellowish brown (10YR 6/4) extremely flaggy clay loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; hard, friable, sticky and plastic; about 70 percent flagstones; lime coatings and few pendants on undersides of rocks; calcareous; moderately alkaline; clear wavy boundary.

IIC2—28 to 60 inches; light brown (7.5YR 6/4) extremely flaggy clay loam, dark brown (7.5YR 4/4) moist; massive; hard, friable, sticky and plastic; about 80 percent flagstones; calcareous; moderately alkaline.

Colors range from 2.5Y through 7.5YR. Depth to calcareous material ranges from 10 to 38 inches. Depth to the IIC horizon ranges from 15 to 30 inches. Rock fragments make up 10 to 35 percent of the volume of most of the solum and 35 to 80 percent of the volume of the IIC horizon. The B2t horizon is 35 to 40 percent clay. The IIC horizon is less than 35 percent clay.

Platoro Series

The Platoro series consists of deep, well drained soils on fans and terraces on alluvial valley floors. These soils formed in alluvium derived principally from basalt. The slope is 0 to 9 percent. The average annual precipitation is about 8 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy over sandy or sandy-skeletal, mixed Argic Cryoborolls.

Typical pedon of Platoro loam, 0 to 3 percent slopes, about 50 feet west of the SE corner of the NE1/4SE1/4 of sec. 17, T. 41 N., R. 7 E.

A1—0 to 8 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure that parts to weak medium granular; hard, friable, nonsticky and nonplastic; noncalcareous; mildly alkaline; clear smooth boundary.

B2t—8 to 17 inches; brown (7.5YR 5/3) clay loam, dark brown (7.5YR 3/3) moist; weak medium prismatic structure that parts to moderate medium subangular blocky; hard, friable, sticky and plastic; thin nearly continuous clay films on ped faces; mildly alkaline; clear smooth boundary.

B3—17 to 21 inches; brown (10YR 5/3) gravelly light clay loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; thin nearly continuous clay films on ped faces and coating gravel; calcareous; mildly alkaline; clear wavy boundary.

C1ca—21 to 33 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; about 40 percent gravel and 5 percent cobblestones; calcium carbonate visible as thin coatings on undersides of pebbles; calcareous; moderately alkaline; clear wavy boundary.

IIC2ca—33 to 60 inches; light brownish gray (10YR 6/2) very gravelly loamy sand, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; 45 percent gravel and 10 percent cobblestones; calcium carbonate coatings on undersides of some pebbles in the upper part of this horizon; calcareous; moderately alkaline.

Depth to the IIC horizon ranges from 20 to 40 inches. Depth to the base of the argillic horizon ranges from 10 to 36 inches. Rock fragments make up 0 to 35 percent of a major part of the solum. Hue ranges from 5Y through 7.5YR, but in some pedons a few subhorizons have hue redder than 7.5YR.

Rock River Series

The Rock River series consists of deep, well drained soils on fans and valley side slopes. These soils formed in calcareous alluvium. The slope is 3 to 25 percent. The average annual precipitation is about 10 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy, mixed Borollic Haplargids.

Typical pedon of Rock River gravelly loam, 3 to 15 percent slopes, about 1,200 feet south and 2,600 feet west of the NE corner of sec. 13, T. 45 N., R. 8 E.

A11—0 to 6 inches; yellowish brown (10YR 5/4) gravelly loam, dark yellowish brown (10YR 3/4) moist; moderate fine granular structure; soft, friable; 25 percent gravel; mildly alkaline; clear smooth boundary.

B1—6 to 9 inches; yellowish brown (10YR 5/4) gravelly sandy clay loam, dark yellowish brown (10YR 3/4) moist; weak medium subangular blocky structure that parts to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; 20 percent gravel; mildly alkaline; clear smooth boundary.

B21t—9 to 12 inches; yellowish brown (10YR 5/4) gravelly sandy clay loam, dark yellowish brown (10YR 3/4) moist; moderate medium and fine subangular blocky structure; hard, friable, sticky and plastic; thin and patchy clay films on faces of peds; 15 percent gravel; mildly alkaline; gradual smooth boundary.

B22t—12 to 23 inches; brown (7.5YR 5/4) gravelly sandy clay loam, dark brown (7.5YR 4/4) moist; weak medium and fine subangular blocky structure; hard, friable, sticky and plastic; moderately thick and patchy clay films on faces of peds; 15 percent gravel; moderately alkaline; gradual smooth boundary.

B3ca—23 to 30 inches; light brown (7.5YR 6/4) gravelly sandy clay loam, dark brown (7.5YR 4/4) moist; weak medium and fine subangular blocky structure that parts to weak fine granular; slightly hard, friable, sticky and plastic; very thin, patchy clay films on faces of peds; 15 percent gravel; calcium carbonate coating bottom of pebbles; calcareous; moderately alkaline; clear smooth boundary.

C1ca—30 to 45 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; 15 percent gravel; calcium carbonate coatings on gravel; calcareous; moderately alkaline; clear wavy boundary.

C2—45 to 60 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable; 25 percent gravel; calcareous; moderately alkaline.

Depth to horizons of calcium carbonate accumulation ranges from 10 to 25 inches. Clay content ranges from 20 to 30 percent in the argillic horizon. From 35 to 55 percent of the argillic horizon is fine sand or coarser sand. Rock fragments, which make up 0 to 20 percent of the soil, are mainly less than 3/4 inch in diameter. Hue of the B2t horizon ranges from 2.5Y through 7.5YR.

Sabe Series

The Sabe series consists of deep, well drained to somewhat excessively drained soils on fans. These soils formed in alluvium from sand. The slope is 15 to 25 percent. The average annual precipitation is about 14 inches, and the average annual air temperature is about 40 degrees F.

These soils are sandy-skeletal, mixed Psammentic Eutroboralfs.

Typical pedon of Sabe very stony loam, 9 to 25 percent slopes, in unsectioned area in Baca Grande subdivision, about 500 feet south of Crestone Creek; about 500 feet south and 400 feet west of the SE corner of sec. 8, T. 43 N., R. 12 E.

A1—0 to 7 inches; very dark grayish brown (10YR 3/2) very stony sandy loam, dark brown (7.5YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; 20 percent gravel, 20 percent cobblestones, 20 percent stones; neutral; clear smooth boundary.

A2—7 to 15 inches; pinkish gray (7.5YR 6/2) very cobbly sandy loam, dark brown (7.5YR 4/4) moist; weak coarse platy structure that parts to weak fine granular; soft, very friable, nonsticky and nonplastic; common fine pores; 15 percent gravel, 30 percent cobblestones; neutral; clear smooth boundary.

B21t—15 to 29 inches; light brown (7.5YR 6/4) very gravelly loamy sand with bands of very gravelly sandy clay loam, strong brown (7.5YR 4/6) moist; weak coarse prismatic structure that parts to weak medium subangular blocky; soft, very friable, slightly sticky and nonplastic; 30 percent gravel, 12 percent cobblestones; neutral; gradual smooth boundary.

B22t—29 to 48 inches; strong brown (7.5YR 5/6) very gravelly loamy sand with bands of sandy clay loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure that parts to moderate fine granular; slightly hard, very friable, slightly sticky and slightly plastic; 30 percent gravel, 10 percent cobblestones; lamellae 1/2 inch to 1 1/2 inches thick and 4 to 5 inches long make up about 35 percent of horizon; neutral; clear smooth boundary.

C—48 to 72 inches; yellowish brown (10YR 5/4) sand, dark yellowish brown (10YR 3/4) moist; single grained; loose, nonsticky and nonplastic; 5 percent gravel, 5 percent cobblestones; neutral.

Rock fragments make up 40 to 80 percent of a major part of the solum and are mainly quartzite and schist. The solum ranges from neutral to mildly alkaline. The B2t horizon has lamellae of sandy clay loam or sandy clay.

The Sabe soils in Saguache County Area are slightly drier than the soils of the Sabe series, and therefore, they are taxadjuncts to the series. For Sabe soils in the

survey area, the average annual precipitation is about 14 inches; but for the Sabe series, it is about 22 inches.

Saguache Series

The Saguache series consists of deep, well drained soils on flood plains and terraces on alluvial valley floors. These soils formed in alluvium. The slope is 0 to 9 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are sandy-skeletal, mixed, frigid Typic Torriorthents.

Typical pedon of Saguache gravelly sandy loam, 0 to 1 percent slopes, about 50 feet north and 150 feet west of the SE corner of the SW1/4NW1/4 of sec. 20, T. 41 N., R. 8 E.

Ap—0 to 8 inches; light brownish gray (10YR 6/2) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak medium granular structure; slightly hard, very friable, nonsticky and nonplastic; 20 percent gravel; moderately alkaline; abrupt smooth boundary.

AC—8 to 16 inches; light yellowish brown (10YR 6/4) gravelly loamy sand, dark yellowish brown (10YR 3/4) moist; single grained; loose, nonsticky and nonplastic; about 25 percent gravel; moderately alkaline; clear smooth boundary.

IIC—16 to 60 inches; pale brown (10YR 6/3) very gravelly sand, brown (10YR 4/3) moist; single grained; loose, nonsticky and nonplastic; about 50 percent gravel; moderately alkaline.

Depth to the IIC horizon ranges from 12 to 25 inches. The content of rock fragments in the control section averages 35 to 65 percent.

San Arcacio Series

The San Arcacio series consists of deep, well drained soils on terraces on alluvial valley floors. These soils formed in alluvium underlain by a sand and gravel substratum. The slope is 0 to 1 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy over sandy or sandy-skeletal, mixed, frigid Typic Haplargids.

Typical pedon of San Arcacio sandy loam, about 2,600 feet east and 100 feet south of the NW corner of sec. 21, T. 41 N., R. 8 E.

Ap1—0 to 5 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak coarse platy structure that parts to moderate fine granular; slightly hard, very friable, slightly sticky and nonplastic; about 5 percent gravel; common fine roots; calcareous; strongly alkaline; clear smooth boundary.

B21t—5 to 11 inches; pale brown (10YR 6/3) light sandy clay loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, firm, slightly sticky and nonplastic; about 10 percent gravel; common fine roots; calcareous; strongly alkaline; clear smooth boundary.

B22t—11 to 19 inches; brown (10YR 5/3) sandy clay loam, dark yellowish brown (10YR 3/4) moist; weak coarse prismatic structure that parts to moderate medium subangular blocky; very hard, firm, sticky and plastic; thin nearly continuous clay films; 10 percent gravel; calcareous; moderately alkaline; clear smooth boundary.

C1ca—19 to 25 inches; brown (10YR 5/3) sandy loam, dark yellowish brown (10YR 3/4) moist; massive; loose, nonsticky and nonplastic; few soft masses of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

IIC2—25 to 60 inches; very gravelly sand; moderately alkaline.

Depth to the IIC horizon ranges from 20 to 40 inches. Rock fragments make up 0 to 15 percent of a major part of the solum. Hue ranges from 5Y through 7.5YR. Depth to subhorizons of visible secondary carbonates ranges from 12 to 40 inches.

San Luis Series

The San Luis series consists of deep, moderately well drained and somewhat poorly drained soils on fans and flood plains on alluvial valley floors. These soils formed in alluvium derived mainly from basalt. The slope is 0 to 1 percent. The average annual precipitation is about 8 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy over sandy or sandy-skeletal, mixed, frigid Aquic Natrargids.

Typical pedon of San Luis sandy loam, 2,000 feet west and 100 feet north of the SE corner of sec. 22, T. 42 N., R. 8 E.

A1—0 to 10 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; moderate fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many fine roots; calcareous; strongly alkaline; clear smooth boundary.

A2—10 to 15 inches; light gray (10YR 7/2) light sandy clay loam, dark grayish brown (10YR 4/2) moist; few fine faint light yellowish brown (10YR 6/4) mottles; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine pores; calcareous; strongly alkaline; clear smooth boundary.

B2tca—15 to 24 inches; pale brown (10YR 6/3) light clay loam, dark brown (10YR 4/3) moist; few fine faint yellowish brown (10YR 5/4, 5/6) mottles; moderate medium columnar structure that parts to moderate medium subangular blocky; hard, friable, sticky and plastic; thin patchy clay films on faces of peds; visible secondary carbonates as thin streaks and seams; calcareous; strongly alkaline; clear smooth boundary.

B3ca—24 to 32 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 4/3) moist; few fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 10 percent gravel; 20 to 25 percent visible secondary carbonates; calcareous; strongly alkaline; clear smooth boundary.

C1g—32 to 37 inches; light brownish gray (2.5Y 6/2) light sandy clay loam, dark brownish gray (2.5Y 4/2) moist; few medium faint pale olive (5Y 6/3) mottles; massive; hard, friable, nonsticky and nonplastic; 10 percent gravel; calcareous; strongly alkaline; clear smooth boundary.

IIC2g—37 to 60 inches; light brownish gray (2.5Y 6/2) very gravelly sand, grayish brown (2.5Y 5/2) moist; single grained; nonsticky and nonplastic; 40 percent gravel and 5 percent cobblestones; very strongly alkaline.

Depth to the seasonal high water table is 1.0 to 3.5 feet. Depth to the IIC horizon ranges from 20 to 40 inches. Hue ranges from 5Y to 7.5YR. Clay content above the IIC horizon ranges from 18 to 35 percent. Depth to the base of the argillic horizon ranges from 8 to 30 inches.

Schrader Series

The Schrader series consists of deep, poorly drained soils on flood plains and low terraces on alluvial valley floors. These soils formed in stratified alluvium. The slope is 0 to 3 percent. The average annual precipitation is about 8 inches, and the average annual air temperature is about 41 degrees F.

These soils are coarse-loamy, mixed, frigid Cumulic Haplaquolls.

Typical pedon of Schrader sandy loam, 0 to 3 percent slopes, about 300 feet east and 300 feet south of the NW corner of sec. 4, T. 43 N., R. 11 E.

A11—0 to 4 inches; brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; weak coarse platy structure; soft, very friable, nonsticky and nonplastic; mildly alkaline; clear wavy boundary.

A12—4 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable; mildly alkaline; clear wavy boundary.

C1g—8 to 24 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; many large prominent yellowish red (10YR 4/6) mottles; massive; soft, very friable, nonsticky and nonplastic; mildly alkaline; clear wavy boundary.

C2g—24 to 46 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (7.5YR 3/2) moist; common medium and fine yellowish red (10YR 4/6) and dark yellowish brown (7.5YR 4/4) mottles; massive; soft, very friable, nonsticky and nonplastic; mildly alkaline; clear wavy boundary.

C3g—46 to 60 inches; stratified gravelly sandy loam, loamy sand, and sand; variegated colors; massive; soft, very friable, nonsticky and nonplastic; neutral to mildly alkaline.

Depth to the seasonal high water table is 1.0 to 2.0 feet. The control section averages 5 to 18 percent clay and 0 to 15 percent rock fragments. Hue ranges from 7.5YR through 5Y.

Seitz Series

The Seitz series consists of deep, well drained soils on mountainsides and ridges. These soils formed in colluvium from igneous rock. The slope is 15 to 65 percent. The average annual precipitation is about 18 inches, and the average annual air temperature is about 34 degrees F.

These soils are clayey-skeletal, montmorillonitic Typic Cryoboralfs.

Typical pedon of Seitz very stony loam, 15 to 65 percent slopes, warm, about 2,150 feet east and 400 feet south of the NW corner of sec. 20, T. 46 N., R. 6 E.

O1—1 inch to 0; needles, twigs, and leaves in various stages of decomposition.

A2—0 to 4 inches; pale brown (10YR 6/3) very stony loam, dark grayish brown (10YR 4/2) moist; weak to moderate fine granular structure; soft, very friable, slightly sticky and nonplastic; 20 percent gravel and 30 percent stones; neutral; clear wavy boundary.

A&B—4 to 12 inches; mixture of variegated colors of about 65 percent brown (10YR 5/3), dark brown (10YR 4/3) moist, and about 35 percent dark yellowish brown (10YR 4/4), dark yellowish brown (10YR 3/4) moist, very stony clay loam, brown (10YR 4/3) crushed and moist; weak to moderate medium subangular blocky structure that parts to weak to moderate fine subangular blocky; slightly hard, very friable; sticky and plastic; 20 percent angular gravel, 40 percent stones; neutral; gradual wavy boundary.

B2t—12 to 23 inches; yellowish brown (10YR 5/4) very stony heavy clay loam, dark yellowish brown (10YR 3/4) moist; moderate medium angular blocky structure that parts to moderate fine subangular

blocky; hard, firm, very sticky and very plastic; thin continuous clay films on faces of peds; contains about 20 percent dark yellowish brown (10YR 4/6) coatings on ped faces; about 20 percent angular gravel, 30 percent stones; neutral; gradual wavy boundary.

B3t—23 to 28 inches; mixed colors of about 75 percent yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) moist, brownish yellow (10YR 6/6) and dark yellowish brown (10YR 4/6) moist, very stony clay; weak to moderate medium subangular blocky structure that parts to weak fine subangular blocky; very hard, friable, very sticky and very plastic; thin and patchy clay films on faces of peds; about 25 percent angular gravel and 30 percent stones; neutral; gradual wavy boundary.

C—28 to 60 inches; yellowish brown (10YR 5/4) extremely stony clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure that parts to weak fine granular; hard, firm, sticky and plastic; 40 percent angular gravel, about 25 percent stones; neutral.

Volume of rock fragments, mainly stones and angular gravel, ranges from 35 to 80 percent throughout the soil profile. Clay content in the argillic horizon ranges from 35 to 55 percent. Depth to the base of the argillic horizon is 17 to 40 inches. Hue ranges from 5Y through 7.5YR; some discontinuous subhorizons are redder than 7.5YR.

Seitz very stony loam, warm, 15 to 65 percent slopes, in Saguache County Area has a longer frost-free period and is slightly drier than the soils in the Seitz series. It is therefore considered a taxadjunct to the series.

Sessions Series

The Sessions series consists of deep, well drained soils on fans and foot slopes. These soils formed in alluvium from igneous rock. The slope is 9 to 35 percent. The average annual precipitation is about 18 inches, and the average annual air temperature is about 40 degrees F.

These soils are fine, montmorillonitic Argic Cryoborolls.

Typical pedon of Sessions loam, 9 to 35 percent slopes, about 1,350 feet south and 950 feet east of the NW corner of sec. 15, T. 48 N., R. 8 E.; approximately 1/8 mile south of old railroad grade, east of Highway 285:

A11—0 to 5 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; moderate medium granular structure; soft, friable, nonsticky and nonplastic; about 10 percent gravel; neutral; clear smooth boundary.

A12—5 to 11 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure that parts to moderate medium granular; slightly hard, friable, slightly sticky and nonplastic; neutral; clear smooth boundary.

A3—11 to 14 inches; very dark grayish brown (10YR 3/2) heavy loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; neutral; clear wavy boundary.

B2t—14 to 28 inches; brown (7.5YR 5/4) gravelly clay, dark brown (7.5YR 4/4) moist; moderate medium prismatic structure; very hard, firm, sticky and very plastic; thin continuous clay films on vertical ped faces; about 15 percent gravel; neutral; clear smooth boundary.

B3—28 to 51 inches; brown (7.5YR 5/4) gravelly clay, dark brown (7.5YR 4/4) moist; weak medium prismatic structure that parts to weak medium subangular blocky; very hard, firm, sticky and very plastic; about 20 percent gravel; mildly alkaline; gradual smooth boundary.

C—51 to 60 inches; light brown (7.5YR 6/4) gravelly clay loam, brown (7.5YR 5/4) moist; massive; very hard, firm, sticky and plastic; about 20 percent gravel; mildly alkaline.

The solum is 20 to more than 40 inches thick. The mollic epipedon is 12 to 15 inches thick. Rock fragments, mainly pebbles, make up 5 to 30 percent of the soil. The A horizon has hue of 7.5YR through 10YR. The B2t horizon has hue of 5YR through 7.5YR. Texture is clay or heavy clay loam. Clay content is 35 to 55 percent.

Shawa Series

The Shawa series consists of deep, moderately well drained soils on fans and terraces on alluvial valley floors. These soils formed in alluvium. The slope is 0 to 4 percent. The average annual precipitation is about 12 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy, mixed Pachic Haploborolls.

Typical pedon of Shawa loam, 0 to 4 percent slopes, about 700 feet north and 200 feet east of the SW corner of sec. 26, T. 42 N., R. 6 E.

A11—0 to 3 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse platy structure that parts to moderate fine granular; soft, friable, nonsticky and nonplastic; moderately alkaline; clear smooth boundary.

A12—3 to 13 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure that parts to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; moderately alkaline; clear smooth boundary.

A13—13 to 36 inches; very dark gray (10YR 3/1) light clay loam, black (10YR 2/1) moist; weak coarse prismatic structure that parts to weak medium subangular blocky; slightly hard, friable, sticky and plastic; mildly alkaline; clear smooth boundary.
ACg—36 to 53 inches; dark grayish brown (10YR 4/2) clay loam, very dark brown (10YR 2/2), common distinct mottles of yellowish brown (10YR 5/4); weak fine subangular blocky structure; slightly hard, friable, sticky and plastic; mildly alkaline; clear smooth boundary.
C1g—53 to 60 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; common distinct mottles of yellowish brown (10YR 5/4) and olive brown (2.5Y 4/4); massive; hard, friable, nonsticky and nonplastic; mildly alkaline.

Depth to the seasonal high water table is 4.0 to 5.0 feet. The depth to calcareous material ranges from 40 to more than 60 inches. Clay content averages 20 to 35 percent in the soil profile above 40 inches, and texture is loam or clay loam. Rock fragments make up 0 to 10 percent of a major part of the soil profile and are dominantly 1 to 10 inches in diameter.

Space City Series

The Space City series consists of deep, somewhat excessively drained soils on low dunes on alluvial valley floors along the margin of intermountain valleys and basins. These soils formed in eolian sand. The slope is 0 to 15 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are mixed, frigid Typic Torripsamments.

Typical pedon of Space City loamy sand, 0 to 6 percent slopes, about 2,315 feet east and 25 feet south of the NW corner of sec. 20, T. 41 N., R. 10 E.

A11—0 to 2 inches; grayish brown (10YR 5/2) loamy sand, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; mildly alkaline; abrupt smooth boundary.
A12—2 to 8 inches; brown (10YR 5/3) loamy sand, dark yellowish brown (10YR 3/4) moist; weak moderate subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; mildly alkaline; clear smooth boundary.
C1—8 to 18 inches; brown (10YR 5/3) loamy sand, dark yellowish brown (10YR 3/4); massive; soft, very friable, nonsticky and nonplastic; moderately alkaline; clear smooth boundary.
C2ca—18 to 60 inches; light brownish gray (10YR 6/2) loamy sand, dark yellowish brown (10YR 3/4) moist; massive; soft, very friable, nonsticky and nonplastic; lime visible in finely divided forms; calcareous; strongly alkaline.

Depth to uniformly calcareous material ranges from 15 to 30 inches. Texture of the control section is loamy sand or sand. Hue ranges from 2.5Y through 7.5YR. Rock fragments make up 0 to 15 percent of the soil and are mainly less than 3 inches in diameter.

Tellura Series

The Tellura series consists of deep, well drained soils on ridges and mountain side slopes. These soils formed in colluvium from igneous rock. The slope is 9 to 65 percent. The average annual precipitation is about 16 inches, and the average annual air temperature is about 38 degrees F.

These soils are clayey-skeletal, montmorillonitic Argic Cryoborolls.

Typical pedon of Tellura very cobbly loam, in an area of Bushvalley-Tellura complex, 9 to 65 percent slopes, about 1,900 feet north and 400 feet west of SE corner of sec. 1, T. 43 N., R. 6 E.

A1—0 to 13 inches; dark gray (10YR 4/1) very cobbly loam, very dark brown (10YR 2/2) moist; moderate medium granular structure that parts to weak fine granular; soft, very friable, nonsticky and nonplastic; about 10 percent gravel, 20 percent cobblestones, and 5 percent stones; slightly acid; clear wavy boundary.
B1—13 to 17 inches; brown (7.5YR 5/2) very cobbly clay loam, dark brown (7.5YR 4/2) moist; weak medium subangular blocky structure that parts to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; about 30 percent cobblestones and 5 percent stones; slightly acid; clear wavy boundary.
B21t—17 to 26 inches; brown (7.5YR 5/4) very cobbly heavy clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure that parts to fine and moderately fine subangular blocky; hard, friable, sticky and plastic; few thin clay films lining interstitial pores; about 20 percent gravel and 30 percent cobblestones; slightly acid to neutral; clear wavy boundary.
B22t—26 to 31 inches; light brown (7.5YR 6/4) very cobbly heavy clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure that parts to moderate fine subangular blocky; hard, firm, sticky and plastic; common thin clay films on faces of peds; about 20 percent gravel and 35 percent cobblestones; calcareous in some places; mildly alkaline; gradual wavy boundary.
B3—31 to 37 inches; pale brown (10YR 6/3) very cobbly clay loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; very hard, firm, sticky and plastic; about 25 percent gravel and 40 percent cobblestones; calcareous in some places; mildly alkaline; gradual wavy boundary.

C1—37 to 48 inches; very pale brown (10YR 7/3) extremely cobbly clay loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, slightly sticky and slightly plastic; about 25 percent gravel and 50 percent cobblestones; calcareous; mildly alkaline; abrupt smooth boundary.
R—48 inches; unweathered rhyolite bedrock; fractured in places.

Bedrock is at a depth of 40 to 60 inches. Reaction ranges from slightly acid through mildly alkaline throughout the profile. Rock fragments make up 35 to 85 percent of most of the soil above the rhyolite bedrock.

Tolman Series

The Tolman series consists of shallow, well drained soils on mountain and foothill side slopes. These soils formed in colluvium from rhyolitic tuff. The slope is 9 to 65 percent. The average annual precipitation is about 12 inches, and the average annual air temperature is about 41 degrees F.

These soils are loamy-skeletal, mixed Lithic Argiborolls.

Typical pedon of Tolman very stony loam, in an area of Tolman-Rock outcrop, 9 to 65 percent slopes, about 2,200 feet north and 400 feet east of SW corner of sec. 12, T. 43 N., R. 6 E.

A1—0 to 4 inches; grayish brown (10YR 5/2) very stony loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; about 20 percent stone, 10 percent cobblestones, 30 percent gravel; neutral; clear smooth boundary.
B2t—4 to 10 inches; dark grayish brown (10YR 4/2) very cobbly clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure that parts to moderate fine subangular blocky; common thin clay films on faces of coarse fragments; slightly hard, very friable, sticky and plastic; about 25 percent gravel, 30 percent cobblestones, and 5 percent stones; neutral; clear smooth boundary.
C1—10 to 13 inches; yellowish brown (10YR 5/4) extremely stony light clay loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, slightly sticky and plastic; about 40 percent stones, 25 percent cobblestones, 15 percent gravel; few thin lime coatings on undersides of rock fragments; mildly alkaline; clear smooth boundary.
R—13 inches; hard fractured rhyolitic tuff.

Depth to lithic contact ranges from 10 to 20 inches. In some profiles the B2t horizon rests abruptly on the underlying bedrock. The A1 horizon is slightly acid to mildly alkaline. The B2t horizon is 28 to 35 percent clay. It is slightly acid to mildly alkaline.

The Tolman soils in Saguache County Area are slightly drier than the soils of the Tolman series, and therefore, they are taxadjuncts to the series. For Tolman soils in the survey area, the average annual precipitation is about 12 inches; but for the series, it is about 15 inches.

Torsido Series

The Torsido series consists of deep, poorly drained soils that are on fans or terraces on alluvial valley floors. These soils formed in alluvium from basalt. The slope is 0 to 1 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy over sandy or sandy-skeletal, mixed, frigid Typic Argiaquolls.

Typical pedon of Torsido loam, 0 to 1 percent slopes, about 725 feet west and 75 feet north of the SE corner of sec. 7, T. 45 N., R. 5 E.

A11—0 to 2 inches; dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; weak very fine subangular blocky structure that parts to weak fine granular; slightly hard, very friable, slightly sticky and slightly plastic; moderately alkaline; abrupt smooth boundary.
A12—2 to 8 inches; dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; moderately alkaline; clear smooth boundary.
B21tg—8 to 13 inches; dark gray (2.5Y 4/0) light clay loam, very dark brown (10YR 2/1) moist; few fine faint light brownish gray (2.5Y 6/2) mottles; moderate medium and coarse subangular blocky structure; slightly hard, friable, sticky and plastic; thin nearly continuous clay films on faces of peds; mildly alkaline; clear smooth boundary.
B22tg—13 to 23 inches; dark gray (10YR 4/1) clay loam, very dark brown (10YR 2/2) moist; few medium faint light brownish gray (2.5Y 6/2) mottles; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; thin, patchy clay films on faces of peds; mildly alkaline; clear smooth boundary.
IIC1—23 to 60 inches; pale brown (10YR 6/3) very gravelly sand, grayish brown (10YR 5/2) moist; many common prominent light yellowish brown (10YR 6/4) blotches; single grained; loose, nonsticky and nonplastic; 40 percent gravel and 10 percent cobblestones; neutral.

Depth to the seasonal high water table is 1.0 foot to 2.0 feet. Depth to the IIC horizon ranges from 20 to 40 inches. Rock fragments make up 0 to 15 percent of the solum. Depth to the base of the argillic horizon ranges from 17 to 40 inches. Hue ranges from 2.5Y through

7.5YR. Clay content in the textural control section ranges from 18 to 35 percent.

Travelers Series

The Travelers series consists of shallow, somewhat excessively drained soils on hills, ridges, and basalt-capped mesas. These soils formed in colluvium from basalt. The slope is 3 to 35 percent. The average annual precipitation is about 9 inches, and the average annual air temperature is 41 degrees F.

These soils are loamy-skeletal, mixed Borollic Lithic Camborthids.

Typical pedon of Travelers very stony loam, 3 to 35 percent slopes, about 1/2 mile south and 1/4 mile west of the NE corner of sec. 24, T. 44 N., R. 7 E.

A1—0 to 4 inches; brown (10YR 5/3) very stony loam, dark brown (10YR 4/3) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; 15 percent angular gravel, 40 percent stones; calcareous; moderately alkaline; clear smooth boundary.

B2—4 to 11 inches; brown (10YR 5/3) very stony loam, dark brown (10YR 4/4) moist; moderate medium subangular blocky structure that parts to moderate fine granular; hard, friable, slightly sticky and nonplastic; 10 percent cobblestones and 35 percent stones; 14 percent calcium carbonates; calcareous; moderately alkaline; clear smooth boundary.

Cca—11 to 13 inches; very pale brown (10YR 8/3) very stony loam, pale brown (10YR 6/3) moist; massive; soft, friable; 10 percent gravel and 25 percent stones; visible secondary calcium carbonate occurring as concretions in thin seams and streaks and as coatings on rock fragments; 25 percent calcium carbonate; calcareous; strongly alkaline; abrupt smooth boundary.

R—13 to 20 inches; hard, unweathered basalt.

Depth to uniformly calcareous material ranges from 0 to 4 inches. Depth to continuous subhorizons of visible calcium carbonate accumulation ranges from 8 to 20 inches. Depth to the lithic contact ranges from 12 to 20 inches. Clay content in the control section ranges from 15 to 27 percent. Rock fragments make up 35 to 85 percent of the volume. Hue ranges from 7.5YR through 10YR.

Uracca Series

The Uracca series consists of deep, well drained soils on alluvial fans and mountain side slopes. These soils formed in cobbly and gravelly alluvium derived from igneous and metamorphic rocks. The slope is 15 to 45 percent. The average annual precipitation is about 12 inches, and the average annual air temperature is about 43 degrees F.

These soils are loamy-skeletal, mixed Aridic Argiborolls.

Typical pedon of Uracca very cobbly loam, 15 to 45 percent slopes, about 1 mile south of the Willow Creek, on the east side of road in the Baca Grande subdivision, in an unsectioned area of T. 43 N., R. 12 E.

A1—0 to 4 inches; grayish brown (10YR 5/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; 15 percent gravel, 35 percent cobblestones; neutral; clear wavy boundary.

B21t—4 to 13 inches; brown (7.5YR 5/4) very cobbly clay loam, dark brown (7.5YR 4/2) moist; moderate medium subangular blocky structure that parts to moderate fine subangular blocky; hard, firm, slightly sticky and slightly plastic; thin patchy clay films on faces of peds and few coatings on rocks; 20 percent gravel, 40 percent cobblestones; neutral; clear wavy boundary.

B22t—13 to 21 inches; light brown (7.5YR 6/4) extremely cobbly sandy clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure that parts to strong fine subangular blocky; very hard, friable, slightly sticky and slightly plastic; thin patchy clay films on faces of peds; 20 percent gravel, 50 percent cobblestones; mildly alkaline; clear wavy boundary.

B3ca—21 to 28 inches; light brown (7.5YR 6/4) extremely cobbly sandy clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure that parts to moderate fine granular; very hard, friable, slightly sticky and slightly plastic; 30 percent gravel, 50 percent cobblestones; visible secondary calcium carbonate occurring as concretions and coatings on the cobblestones; calcareous; moderately alkaline; clear wavy boundary.

C1ca—28 to 36 inches; pink (7.5YR 7/4) extremely cobbly loam, light brown (7.5YR 6/4) moist; massive, very hard, friable, slightly sticky and slightly plastic; 70 percent cobblestones; visible secondary calcium carbonate occurring as concretions and coatings on the cobblestones; calcareous; moderately alkaline; clear wavy boundary.

C2ca—36 to 60 inches; pink (7.5YR 7/4) extremely cobbly sandy loam, light brown (7.5YR 6/4) moist; massive; very hard, firm; 20 percent gravel, 65 percent cobblestones; visible secondary calcium carbonate occurring as concretions and coatings on the cobblestones; calcareous; moderately alkaline.

Hue ranges from 2.5Y through 7.5YR. Depth to uniformly calcareous material ranges from 6 to 40 inches, but the upper part of the B2t horizon does not contain lime. The content of rock fragments is 35 to 85

percent. The fragments typically are 3 to 10 inches in diameter.

Vastine Series

The Vastine series consists of deep, poorly drained soils on flood plains on alluvial valley floors. These soils formed in alluvium. The slope is 0 to 1 percent. The average annual precipitation is about 8 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy over sandy or sandy-skeletal, mixed, frigid Typic Haplaquolls.

Typical pedon of Vastine loam, about 200 feet east and 400 feet north of the SW corner of sec. 26, T. 47 N., R. 9 E.

A11—0 to 8 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; moderately alkaline; gradual smooth boundary.

B2g—8 to 22 inches; gray (10YR 5/1) loam, black (10YR 2/1) moist; common fine, faint dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; moderately alkaline; clear smooth boundary.

IICg—22 to 60 inches; light brownish gray (10YR 6/2) gravelly loamy sand, dark grayish brown (10YR 4/2) moist; massive; loose, nonsticky and nonplastic; 20 percent gravel; moderately alkaline.

Depth to the seasonal high water table is 1.0 to 3.5 feet. The soils range from mildly alkaline to moderately alkaline in most subhorizons in the control section. The upper part of the control section is 20 to 30 percent clay and 0 to 15 percent rock fragments. Hue ranges from 5Y through 7.5YR. Fine lenses of sand and gravel are in the B2g and IICg horizons in some pedons.

Villa Grove Series

The Villa Grove series consists of deep, well drained soils on flood plains and terraces on alluvial valley floors. These soils formed in alluvium. The slope is 0 to 1 percent. The average annual precipitation is about 7 inches, and the average annual air temperature is about 41 degrees F.

These soils are fine-loamy, mixed Aridic Argiborolls.

Typical pedon of Villa Grove sandy clay loam, about 500 feet north and 150 feet east of the SW corner of sec. 6, T. 43 N., R. 8 E.

Ap—0 to 8 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, friable; calcareous; moderately alkaline; clear smooth boundary.

B21t—8 to 12 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; thin patchy clay films on surfaces of peds; calcareous; moderately alkaline; clear smooth boundary.

B22t—12 to 18 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate medium and fine subangular blocky structure; slightly hard, friable; thin nearly continuous clay films on surfaces of peds; calcareous; moderately alkaline; clear smooth boundary.

B3ca—18 to 32 inches; very pale brown (10YR 7/3) sandy clay loam, brown (10YR 5/3) moist; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; about 5 percent gravel; calcium carbonate visible as spots, seams, and finely divided forms; calcareous; moderately alkaline; clear smooth boundary.

C1ca—32 to 40 inches; very pale brown (10YR 7/4) gravelly sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; about 15 percent gravel; calcium carbonate visible in finely divided forms; calcareous; moderately alkaline; clear smooth boundary.

C2—40 to 60 inches; yellowish brown (10YR 5/4) gravelly sandy loam; dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; about 20 percent gravel; calcareous; moderately alkaline.

Depth to the base of the argillic horizon ranges from 15 to 30 inches. Continuous subhorizons of visible secondary calcium carbonate or sulfate accumulation are at a depth of 15 to 40 inches. Rock fragments make up 0 to 15 percent of most of the solum above 40 inches and are mainly 1 to 3 inches in diameter. Hue ranges from 5Y through 7.5YR.

Formation of the Soils

Soil is the collection of dynamic natural bodies on the earth's surface containing living matter and supporting, or capable of supporting, plants. Soil may be modified or even made by man.

Five main soil-forming factors interact to produce soils that differ in appearance, composition, productivity, and management requirements, sometimes within short distances of one another. These factors are parent material, climate, plant and animal life, relief, and time. Soil formation is the effect of climate and living matter (*13*) acting on the parent material in which the soil forms, as conditioned by relief over time. Generally, soils that exhibit distinct genetic horizons have been forming for a long period of time.

In any given area, the extent to which each factor influences soil development is highly variable, although all factors contribute to some extent. The following discussion defines the factors of soil formation as they relate to the soils of the survey area.

Parent Material

Parent material is the unconsolidated mass in which soil forms. This material could have weathered in place or have been transported from the original source by wind or water.

Parent material influences soil formation in many ways. It largely determines the texture, structure, color, consistence, and arrangement of horizons. It also affects the rate of formation by its resistance to weathering (*19*). Parent material also affects fertility and erodibility of soils. The soils in the Saguache County Area formed in four major kinds of parent material—eolian sandy deposits, alluvium, granitic rocks of Precambrian age, and volcanic rocks of Tertiary age.

The Great Sand Dunes National Monument is in the southeastern part of the survey area, where the prevailing winds from the southwest have deposited sand against the Sangre de Cristo Range. About 21,000 acres of continually shifting sands is in the Dune land map unit. Where plant growth has been able to stabilize these eolian deposits, weak horizons have formed in the Corlett, Cotopaxi, and Space City soils. Ouray and Sabe soils formed in eolian deposits on the side slopes of the Sangre de Cristo Range. These eolian deposits are composed of fine and medium sand dominated by quartzitic and basaltic rocks. This material was washed down from the surrounding mountains by streams and then transported by wind.

The majority of soils in the Saguache County Area formed in alluvium from mixed sources. This material has a wide range in characteristics, depending largely on its source, distance from the source, and the relief. It was deposited by major drainageways, such as the Rio Grande River south of Saguache County, Saguache Creek, San Luis Creek, and many streams and creeks originating in the San Juan Mountains to the west and the Sangre de Cristo Range to the east of the valley.

Derrick, Dunul, Graypoint, Norte, Platoro, and San Arcacio soils formed in a thin mantle of medium textured material overlying beds of sand, gravel, and cobblestones, mainly of volcanic origin. These nearly level to moderately sloping soils are on alluvial fans.

Crestvale, Laney, Luhon, Monte, and Villa Grove soils formed in medium textured, calcareous alluvium derived mainly from the weathering of volcanic rocks of quartz latite and rhyolite. The gypsum in some of these soils was derived from sulfates and sulfides in the volcanic rocks.

The deep, poorly drained Acasco, Alamosa, Big Blue, Gerrard, and Vastine soils formed in medium to fine textured volcanic alluvium on flood plains and along creeks.

The Arena, Biedell, Hooper, and San Luis soils formed in medium textured and moderately fine textured alluvium overlying sandy alluvium. This material was deposited on old flood plains and derived from weathered volcanic rock high in sodium. The Hapney and Harlem soils formed in depressions and old lakebeds of clayey sediments high in salt and sodium.

The moderately coarse textured and coarse textured alluvial material in which the Gunbarrel and Mosca soils formed was deposited by the Rio Grande River on flood plains and fans. This material was derived mainly from latite and rhyolite.

The Costilla, Mount Home, Saguache, and Uracca soils formed in coarse-textured alluvium weathered from granitic and gneissic rocks of Precambrian age. The steep Mount Home and Uracca soils are on cobbly fans of the Sangre de Cristo Range. Saguache and Costilla soils are on sandy fans.

Bushvalley, Parlin, and Tellura soils formed in colluvium derived mainly from rhyolite and associated volcanic rock, which was transported only a short

distance. These soils have a cobbly and stony subsoil. The Seitz soils formed in slopewash material of similar volcanic rock.

The Comodore soils formed on steep slopes of the Sangre de Cristo Range in moderately fine textured material weathered from granitic rock of Precambrian age. This material is resistant to weathering.

Cheadle, Hopkins, and Tolman soils formed in colluvium and residuum of rhyolite and welded tuff of Tertiary age. These soils are shallow to bedrock or deep and channery. The Travelers soils formed in medium textured, calcareous material weathered from basaltic rock, also of Tertiary age.

Climate

The climate of an area, particularly soil temperature and moisture, affect the physical and chemical weathering of parent material and the rate of biological activity. Generally, soil-forming processes are more active when temperatures are warm and moisture is adequate, but not excessive. Wind velocity and humidity are also factors having a significant influence. The seasonal high water table in a part of the survey area creates soil climates that are more moist than normal for the survey area.

The climate of Saguache County Area is cold and dry. The foothill areas are slightly warmer and more moist. The mountainous areas fringing the valley are colder and even more moist than the foothills. In the southern town of Center, at an elevation of 7,640 feet, the average annual air temperature is about 41 degrees F, and the average summer temperature is about 61 degrees F. The average annual precipitation is about 7 inches. At Saguache, elevation 7,700 feet, the average annual air temperature is about 43 degrees F; the average summer temperature is about 62 degrees F; and the average annual precipitation is about 8.5 inches. In the mountains, the average temperature is about 10 degrees cooler, and the average precipitation is about 18 inches. The average snowfall is about 29 to 35 inches in the valley and is as much as 100 inches or more in the mountains.

The downward movement of water through a soil removes calcium carbonates and other soluble salts from the upper horizon and deposits them in the B or C horizon. Water also moves clay particles downward so that they often accumulate in the B horizon. The low rainfall of the area is reflected in the low degree of soil horizon differentiation in such soils as Costilla, Gunbarrel, and Laney. The sandy soils, such as Space City and Cotopaxi soils, transmit water rapidly through the profile and thus have carbonates leached to a greater depth. The soils that are not sandy often will be calcareous at or near the surface, indicating a slow leaching process.

Soil moisture also influences the type and amount of vegetation the soil supports and, thus, the amount of organic matter returned to the soil. Where moisture is limited and vegetation is sparse, the amount of yearly addition of decayed organic matter to the soil is very low. These soils have light-colored surface layers. Soils on mountains generally receive more moisture and are able to support a more dense vegetative cover. As a result, more organic matter is added to the soil.

Soil temperature and moisture not only affect the growth of plants but also the weathering of parent material. Generally, the warmer and more moist climate causes more complete weathering of parent materials.

Much of the Saguache County Area is influenced by a high water table part of the year. This water table restricts the downward movement of salts and calcium carbonates. These salts accumulate in the solum or are carried to the surface by capillary rise as moisture evaporates from the soil. The soils affected by a high water table may have horizons of concentrated salts and commonly are mottled or gleyed in the substratum, where aeration is inadequate. The soils that have a high water table will support a luxuriant vegetative cover unless salts or alkali prevent growth.

Time

Time, or age, refers to the length of time the processes of soil formation have been active. Generally, it takes a long time for a soil to develop strong genetic horizons.

The youngest soils generally are on flood plains and in overflow areas where they receive fairly regular additions of sediments. These soils usually appear stratified, but they have not been in place long enough to develop differentiating horizons, which characterize soil genesis. An A, C horizon sequence is common to these soils. The Schrader soil is a stratified soil that has an A, C profile. Young soils also are on steep slopes where geologic erosion has kept pace with the alteration of parent material and thus prevented horizon development. These soils are characterized by an A, C, R sequence of horizons. Another type of young soil in the Saguache County Area are those soils forming in recently stabilized eolian deposits. Because of the shifting nature of these deposits, they have not been in place long enough to develop genetic horizons. The Cotopaxi soil is characteristic of this type and has an A, C profile.

Older soils generally have developed a horizon of clay enrichment and horizons of concentrated calcium carbonates. A typical pedon may include A, Bt, and Cca horizons. Uracca and Villa Grove soils are older soils of the survey area.

Relief

Relief is a soil-forming factor that modifies the effects of climate and vegetation chiefly by controlling the amount of runoff and the degree of soil drainage. Because relief influences drainage, it affects vegetative growth and microbial activity. Many soils of the Saguache County Area are nearly level and have restricted drainage. Because of the nearly level topography, surface runoff is slow and water erosion is none to slight. A fluctuating water table that causes periodic poor drainage influences the processes of soil formation. This is evident in soils such as Acasco, Alamosa, and Vastine soils, where alternate oxidation and reduction have produced mottling in the subsoil.

On steep slopes where runoff is rapid, geologic erosion often keeps pace with soil formation and prevents a soil from developing distinct soil horizons. Steeply sloping soils are often well drained or excessively drained. The combined effects of drainage and rapid runoff decrease the amount of effective precipitation these soils receive. The soils in lower positions on the landscape receive the runoff from steeper soils, and this tends to slightly increase the effective precipitation they receive.

Plant and Animal Life

Vegetation, micro-organisms, earthworms, and other forms of plant and animal life are important in soil formation. The kinds of plant cover and micro-organisms growing in any particular area are controlled mainly by soil temperature, soil moisture supply, and the physical and chemical characteristics of the parent material. In the Saguache County Area, soil moisture is the greatest limiting factor on well drained sites. In the mountainous areas, moisture and temperature are limiting factors for plant and animal activity.

Most of the valley soils in the Saguache County Area formed under a thin cover of shrubs and short grasses. Because of this sparse vegetation, little plant residue is returned to the soil; therefore, the organic matter content of the soil is typically low, averaging 0.5 to 1.5 percent in the upper part of the solum. Soils in poorly drained areas receive additional moisture supplies and support a more dense stand of sedges, rushes, and water-tolerant grasses. These soils have a greater return of residue and, thus, a higher percentage of organic matter that extends to a greater depth in the soil profile.

The mountainous soils formed under various kinds of vegetation. Some soils formed under spruce and fir trees; others formed under mid and tall grasses. Some soils formed under pinyon and juniper.

Micro-organisms play a major role in soil formation. One of the most important functions is the breaking down of plant residue. Microbial activity is high as long as temperatures are warm and moisture is adequate. In summer, when soil moisture depends on small, infrequent showers, the activity of micro-organisms fluctuates with the moisture supply, being most active when moisture is adequate and decreasing when the soil dries out. Although micro-organism activity fluctuates, it is sufficient to thoroughly break down the small yearly return of plant residue. Consequently, the well drained soils are characterized by a low organic matter content, highly stable forms of residual organic compounds, and a distribution pattern where the organic matter is concentrated in the upper few inches of the profile. The maximum amount of organic matter coincides with the greatest concentration of plant roots. In those soils having a high water table to keep the soil moist, microbial activity is continual during the warm seasons. These soils support a more luxuriant growth of plants, and a greater amount of plant residue is returned to the soil each year. Consequently, larger amounts of decomposed organic matter accumulate to a greater depth in the soil. These soils will be darker colored to a greater depth than the well drained soils.

Very poorly drained soils remain wet most of the time and are inhabited mainly by anaerobic micro-organisms. Under such conditions, decomposition is often incomplete and undecomposed organic matter may accumulate on the soil surface.

Earthworms and burrowing animals help to mix the soil, carrying surface soil enriched with organic matter farther down in the solum and bringing up unconsolidated parent material, which can be acted upon by soil-forming factors.

Man is also an important factor in soil formation. Man irrigates farmland and changes the climate by his additions of water (*22*). Man artificially drains cropland to grow crops that produce large amounts of residue which, if returned to the soil, add organic matter and help fertilize future crops.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial valley floors. The floors of alluvial valleys that are covered with unconsolidated stream-laid deposits. The water in the streams in these valleys is sufficient for subirrigation or for flood irrigation of crops.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cross fencing. Dividing an area of land with a permanent fence, which acts as a barrier to livestock or big game to achieve improved grazing use.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy

material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess alkali (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:
O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.
A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.
A2 horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.
B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A horizon to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.
C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Arabic numeral 2 precedes the letter C.
R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of

the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range pitting. Mechanical treatment used on rangeland to increase water infiltration rates on rangeland in poor condition. The machine makes shallow trenches 3 to 4 feet long, 4 inches deep, and 6 inches wide. These pits form miniature dams that catch water and allow it to be absorbed into the soil, which helps to increase growth of the native vegetation.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of

exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes results in disintegration and decomposition of the material.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-78 at Saguache, Colorado]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	36.0	3.8	19.9	55	-20	9	.26	.02	.44	1	4.1
February	41.4	10.2	25.9	60	-12	20	.23	.03	.38	1	3.5
March	49.4	16.8	33.2	68	0	15	.37	.09	.58	2	4.5
April	58.9	24.1	41.5	74	8	107	.62	.12	1.00	2	4.5
May	68.5	33.0	50.7	81	18	336	.74	.16	1.20	3	.7
June	77.7	40.6	59.2	88	28	576	.57	.13	.91	2	.0
July	81.7	46.7	64.2	90	38	750	1.66	.74	2.44	5	.0
August	79.1	44.7	61.9	88	34	679	1.65	.89	2.32	6	.0
September	73.4	36.4	54.9	85	23	447	.83	.25	1.30	3	.2
October	63.5	27.3	45.4	76	11	195	.84	.11	1.39	2	2.6
November	47.9	15.3	31.6	66	-7	26	.49	.07	.81	2	3.8
December	37.2	5.8	21.5	55	-16	11	.38	.06	.61	1	5.5
Year	59.6	25.4	42.5	90	-22	3,171	8.64	6.39	10.71	30	29.4

[1] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-78 at Saguache, Colorado]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 19	June 1	June 21
2 years in 10 later than--	May 14	May 28	June 16
5 years in 10 later than--	May 4	May 19	June 6
First freezing temperature in fall:			
1 year in 10 earlier than--	September 26	September 14	September 1
2 years in 10 earlier than--	October 1	September 20	September 6
5 years in 10 earlier than--	October 11	September 30	September 16

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-78 at Saguache, Colorado]

Probability	Length of growing season if daily minimum temperature is---		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	139	111	79
8 years in 10	146	118	87
5 years in 10	159	133	101
2 years in 10	172	147	116
1 year in 10	179	155	124

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Acasco clay loam	6,552	0.7
2	Alamosa clay loam	3,805	0.4
3	Alamosa clay loam, saline	4,586	0.5
4	Arena loam	2,016	0.2
5	Biedell clay loam	11,390	1.3
6	Big Blue clay loam, 0 to 3 percent slopes	5,166	0.6
7	Big Blue-Gerrard complex, 0 to 3 percent slopes	727	0.1
8	Big Blue-Hagga, dry complex	2,041	0.2
9	Bushvalley cobbly loam, 3 to 45 percent slopes	8,820	1.0
10	Bushvalley-Gelkie-Rock outcrop complex, 3 to 65 percent slopes	27,921	3.1
11	Bushvalley-Tellura complex, 9 to 65 percent slopes	16,985	1.9
12	Comodore very stony loam, 25 to 65 percent slopes	9,047	1.0
13	Comodore-Rock outcrop complex, 40 to 65 percent slopes	24,621	2.7
14	Corlett-Hooper complex, 0 to 15 percent slopes	13,154	1.4
15	Costilla gravelly loamy sand, 0 to 3 percent slopes	1,461	0.2
16	Cotopaxi sand, 2 to 15 percent slopes	50,700	5.6
17	Crestvale loam	2,520	0.3
18	Cryaquolls and Histosols, nearly level	1,713	0.2
19	Decross loam, 1 to 15 percent slopes	2,444	0.3
20	Derrick very gravelly loam, 0 to 3 percent slopes	6,555	0.7
21	Des Moines gravelly clay loam, dry, 0 to 2 percent slopes	2,570	0.3
22	Duneland	20,387	2.2
23	Dunul very gravelly sandy loam	3,150	0.3
24	Garita gravelly loam, 0 to 3 percent slopes	2,218	0.2
25	Garita gravelly loam, 3 to 25 percent slopes	23,386	2.6
26	Garita-Platoro complex, 1 to 9 percent slopes	7,938	0.9
27	Gelkie loam, 3 to 25 percent slopes	4,737	0.5
28	Gerrard loam, 0 to 3 percent slopes	10,382	1.1
29	Graypoint gravelly sandy loam, 0 to 3 percent slopes	15,724	1.7
30	Gunbarrel loamy sand	5,645	0.6
31	Gunbarrel loamy sand, saline	6,300	0.7
32	Hagga loam, dry	31,399	3.5
33	Hapney clay loam	21,244	2.3
34	Harlem, dry-Slickspots complex	8,265	0.9
35	Hooper loamy sand	19,505	2.1
36	Hooper clay loam	26,485	2.9
37	Hopkins-Cheadle-Rock outcrop complex, 3 to 35 percent slopes	14,918	1.6
38	Humic Cryaquepts, nearly level, acid overwash	655	0.1
39	Jodero loam, 0 to 3 percent slopes	1,991	0.2
40	Jodero-Lolo, wet complex, 0 to 6 percent slopes	5,040	0.6
41	Kerber loamy sand	18,371	2.0
42	Laney loam, 0 to 3 percent slopes	40,280	4.4
43	Luhon loam, 0 to 3 percent slopes	17,042	1.9
44	Luhon loam, 3 to 6 percent slopes	9,299	1.0
45	McGinty sandy loam, 0 to 3 percent slopes	731	0.1
46	Medano fine sandy loam	5,721	0.6
47	Medano-Hapney complex	1,058	0.1
48	Monte loam, 0 to 3 percent slopes	2,570	0.3
49	Morval clay loam, 3 to 6 percent slopes	1,738	0.2
50	Mosca loamy sand, 0 to 3 percent slopes	17,363	1.9
51	Mount Home-Saguache complex, 2 to 25 percent slopes	18,472	2.0
52	Norte gravelly sandy loam	11,164	1.2
53	Ouray-Sabe, dry complex, 9 to 25 percent slopes	3,830	0.4
54	Parlin gravelly loam, 3 to 35 percent slopes	10,709	1.2
55	Platoro loam, 0 to 3 percent slopes	14,541	1.6
56	Platoro cobbly loam, 3 to 9 percent slopes	5,493	0.6
57	Rock outcrop, steep	13,028	1.4
58	Rock River gravelly loam, 3 to 15 percent slopes	15,069	1.7
59	Rock River gravelly loam, 15 to 25 percent slopes	2,117	0.2
60	Saguache gravelly sandy loam, 0 to 1 percent slopes	5,116	0.6
61	Saguache gravelly sandy loam, 3 to 9 percent slopes	2,419	0.3
62	San Arcacio sandy loam	7,686	0.8
63	San Luis sandy loam	40,600	4.5
64	San Luis sandy loam, drained	13,230	1.5
65	Schrader sandy loam, 0 to 3 percent slopes	2,420	0.3
66	Seitz very stony loam, 15 to 65 percent slopes	731	0.1
67	Seitz very stony loam, warm, 15 to 65 percent slopes	34,400	3.8
68	Sessions loam, 9 to 35 percent slopes	958	0.1
69	Shawa loam, 0 to 4 percent slopes	3,880	0.4
70	Space City loamy sand, 0 to 6 percent slopes	19,810	2.2
71	Space City loamy sand, saline, 0 to 3 percent slopes	16,682	1.8
72	Space City-Hooper complex, 0 to 15 percent slopes	5,594	0.6

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
73	Tolman, dry Rock outcrop complex, 9 to 65 percent slopes	20,739	2.3
74	Torsido loam, 0 to 1 percent slopes	12,550	1.4
75	Torsido-Gerrard complex, 0 to 3 percent slopes	1,058	0.1
76	Travelers very stony loam, 3 to 35 percent slopes	19,026	2.1
77	Travelers-Garita complex, 6 to 35 percent slopes	23,486	2.6
78	Uracca very cobbly loam, 15 to 45 percent slopes	14,591	1.6
79	Vastine loam	11,743	1.3
80	Vastine loam, alkali	4,889	0.5
81	Villa Grove sandy clay loam	2,772	0.3
	Water	1,024	0.1
	Total	908,160	100.0

TABLE 5.--YIELDS PER ACRE OF IRRIGATED CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Alfalfa hay	Barley	Irish potatoes	Lettuce	Grass hay	Pasture
	Ton	Bu	Cwt	Crate	Ton	AUM*
1---------- Acasco	5.0	120	---	---	2.0	2.0
2---------- Alamosa	3	65	170	400	2.0	1.5
3---------- Alamosa	2.5	55	80	275	1.5	1.5
4---------- Arena	1.5	40	---	---	---	1.5
5---------- Biedell	---	---	---	---	---	---
6---------- Big Blue	---	---	---	---	2.0	2.0
7---------- Big Blue-Gerrard	---	---	---	---	2.0	2.0
8---------- Big Blue-Hagga	---	---	---	---	1.8	1.8
9---------- Bushvalley	---	---	---	---	---	---
10---------- Bushvalley-Gelkie-Rock outcrop	---	---	---	---	---	---
11---------- Bushvalley-Tellura	---	---	---	---	---	---
12---------- Comodore	---	---	---	---	---	---
13---------- Comodore-Rock outcrop	---	---	---	---	---	---
14---------- Corlett-Hooper	---	---	---	---	---	---
15---------- Costilla	4.0	90	300	---	---	---
16---------- Cotopaxi	---	---	---	---	---	---
17---------- Crestvale	3.0	80	---	---	---	---
18---------- Cryaquolls and Histosols	---	---	---	---	---	---
19---------- Decross	3.5	70	---	---	---	---
20---------- Derrick	3.5	95	300	450	---	---
21---------- Des Moines	4.0	100	---	---	2	2

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF IRRIGATED CROPS AND PASTURE--Continued

Soil name and map symbol	Alfalfa hay	Barley	Irish potatoes	Lettuce	Grass hay	Pasture
	Ton	Bu	Cwt	Crate	Ton	AUM*
22. Duneland						
23---------- Dunul	4.0	95	250	400	---	---
24---------- Garita	---	---	---	---	---	---
25---------- Garita	---	---	---	---	---	---
26---------- Garita-Platoro	---	---	---	---	---	---
27---------- Gelkie	---	---	---	---	---	---
28---------- Gerrard	4.0	100	---	---	2.0	2.0
29---------- Graypoint	4.0	115	300	450	---	---
30---------- Gunbarrel	4.0	110	300	400	---	---
31---------- Gunbarrel	3.0	85	200	---	---	---
32---------- Hagga	3.0	75	---	---	1.5	1.5
33---------- Hapney	3.0	75	---	---	1.0	1.0
34---------- Harlem-Slickspots	---	---	---	---	---	---
35---------- Hooper	---	---	---	---	---	---
36---------- Hooper	---	---	---	---	---	---
37---------- Hopkins-Cheadle-Rock outcrop	---	---	---	---	---	---
38---------- Humic Cryaquepts	---	---	---	---	---	---
39---------- Jodero	2.8	55	---	---	2.0	2.0
40---------- Jodero-Lolo	---	---	---	---	---	---
41---------- Kerber	1.5	80	---	---	---	---
42---------- Laney	3.5	85	---	---	---	---
43---------- Luhon	5.0	120	---	---	---	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF IRRIGATED CROPS AND PASTURE--Continued

Soil name and map symbol	Alfalfa hay	Barley	Irish potatoes	Lettuce	Grass hay	Pasture
	Ton	Bu	Cwt	Crate	Ton	AUM*
44---------- Luhon	3.5	90	---	---	---	---
45---------- McGinty	5.0	120	350	400	1.5	---
46---------- Medano	1.5	80	---	---	1.5	1.5
47---------- Medano-Hapney	2.0	79	---	---	1.3	1.3
48---------- Monte	4.5	100	275	450	---	---
49---------- Morval	---	---	---	---	---	---
50---------- Mosca	2.5	60	300	400	---	---
51---------- Mount Home-Saguache	---	---	---	---	---	---
52---------- Norte	5.0	120	350	500	---	---
53---------- Ouray-Sabe	---	---	---	---	---	---
54---------- Parlin	---	---	---	---	---	---
55---------- Platoro	5.0	120	300	---	---	---
56---------- Platoro	---	---	---	---	---	---
57---------- Rock outcrop	---	---	---	---	---	---
58---------- Rock River	---	60	---	---	2	3.5
59. Rock River						
60---------- Saguache	4.0	95	250	400	---	---
61---------- Saguache	---	---	---	---	---	---
62---------- San Arcacio	5.0	120	350	500	---	---
63---------- San Luis	3.0	70	125	---	1.5	1.5
64---------- San Luis	4.5	110	250	400	---	---
65---------- Schrader	5.0	120	---	---	2.0	2.0
66, 67---------- Seitz	---	---	---	---	---	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF IRRIGATED CROPS AND PASTURE--Continued

Soil name and map symbol	Alfalfa hay	Barley	Irish potatoes	Lettuce	Grass hay	Pasture
	Ton	Bu	Cwt	Crate	Ton	AUM*
68---------- Sessions	---	---	---	---	---	---
69---------- Shawa	3.5	80	---	450	3.0	---
70, 71---------- Space City	1.0	50	200	---	---	---
72---------- Space City-Hooper	---	---	---	---	---	---
73---------- Tolman-Rock outcrop	---	---	---	---	---	---
74---------- Torsido	4.0	110	---	---	2.0	2.0
75---------- Torsido-Gerrard	4.0	107	---	---	2.0	2.0
76---------- Travelers	---	---	---	---	---	---
77---------- Travelers-Garita	---	---	---	---	---	---
78---------- Uracca	---	---	---	---	---	---
79---------- Vastine	1.5	80	---	---	2.0	2.0
80---------- Vastine	1.5	---	---	---	2.0	2.0
81---------- Villa Grove	4.5	120	250	500	---	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
1---------- Acasco	Wet Meadow----------	Favorable	3,000	Tufted hairgrass----------	30
		Normal	2,500	Slender wheatgrass----------	20
		Unfavorable	2,000	Nebraska sedge----------	20
				Western wheatgrass----------	15
				Bluejoint reedgrass----------	10
				Baltic rush----------	5
2---------- Alamosa	Wet Meadow----------	Favorable	3,700	Slender wheatgrass----------	20
		Normal	3,100	Western wheatgrass----------	15
		Unfavorable	2,500	Nebraska sedge----------	15
				Tufted hairgrass----------	15
				Bluejoint reedgrass----------	10
				Baltic rush----------	5
3---------- Alamosa	Salt Meadow----------	Favorable	3,100	Alkali sacaton----------	50
		Normal	2,500	Western wheatgrass----------	15
		Unfavorable	1,900	Slender wheatgrass----------	10
				Baltic rush----------	10
				Alkali cordgrass----------	10
				Nebraska sedge----------	5
4---------- Arena	Chico Land----------	Favorable	950	Black greasewood----------	70
		Normal	550	Inland saltgrass----------	10
		Unfavorable	300	Rubber rabbitbrush----------	10
				Alkali sacaton----------	5
5---------- Biedell	Alkali Overflow----------	Favorable	1,100	Inland saltgrass----------	50
		Normal	900	Creeping wildrye----------	15
		Unfavorable	700	Baltic rush----------	10
				Alkali bluegrass----------	5
				Greasewood----------	5
6---------- Big Blue	Wet Meadow----------	Favorable	3,750	Tufted hairgrass----------	30
		Normal	3,150	Slender wheatgrass----------	20
		Unfavorable	2,500	Western wheatgrass----------	10
				Bluejoint reedgrass----------	10
				Baltic rush----------	5
				American bistort----------	5
7*: Big Blue----------	Wet Meadow----------	Favorable	3,750	Tufted hairgrass----------	30
		Normal	3,150	Slender wheatgrass----------	20
		Unfavorable	2,500	Western wheatgrass----------	10
				Bluejoint reedgrass----------	10
				Baltic rush----------	5
				American bistort----------	5
Gerrard----------	Wet Meadow----------	Favorable	3,700	Tufted hairgrass----------	30
		Normal	3,100	Slender wheatgrass----------	20
		Unfavorable	2,500	Nebraska sedge----------	15
				Bluejoint reedgrass----------	10
				Western wheatgrass----------	10
				Baltic rush----------	5
8*: Big Blue----------	Wet Meadow----------	Favorable	3,750	Tufted hairgrass----------	30
		Normal	3,150	Slender wheatgrass----------	20
		Unfavorable	2,500	Western wheatgrass----------	10
				Bluejoint reedgrass----------	10
				Baltic rush----------	5
				American bistort----------	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
8*:					
Hagga	Salt Meadow	Favorable	1,900	Alkali sacaton	40
		Normal	1,500	Alkali cordgrass	10
		Unfavorable	1,100	Western wheatgrass	10
				Slender wheatgrass	10
				Creeping wildrye	5
				Nebraska sedge	5
				Inland saltgrass	5
				Rabbitbrush	5
				Black greasewood	5
				Baltic rush	5
9	Shallow Loam	Favorable	700	Blue grama	35
Bushvalley		Normal	600	Sideoats grama	25
		Unfavorable	400	Arizona fescue	20
				Mountain muhly	10
				Bottlebrush squirreltail	10
10*:					
Bushvalley	Shallow Loam	Favorable	700	Blue grama	35
		Normal	600	Sideoats grama	25
		Unfavorable	400	Arizona fescue	20
				Mountain muhly	10
				Bottlebrush squirreltail	10
Gelkie	Mountain Loam (10- to 14-inch precipitation zone).	Favorable	1,000	Western wheatgrass	40
		Normal	750	Needleandthread	20
		Unfavorable	400	Arizona fescue	15
				Sandberg bluegrass	10
				Fringed sagebrush	5
				Sedge	5
Rock outcrop.					
11*:					
Bushvalley	Shallow Loam	Favorable	700	Blue grama	35
		Normal	600	Sideoats grama	25
		Unfavorable	400	Arizona fescue	20
				Mountain muhly	10
				Bottlebrush squirreltail	10
Tellura	Shallow Loam	Favorable	1,200	Arizona fescue	30
		Normal	900	Mountain muhly	20
		Unfavorable	600	Parry oatgrass	15
				Letterman needlegrass	15
				Western wheatgrass	10
				True mountainmahogany	5
12	Pinyon-Juniper Woodland	Favorable	525	Currant	20
Comodore		Normal	475	True mountainmahogany	15
		Unfavorable	350	Indian ricegrass	10
				Bottlebrush squirreltail	10
				Fringed sagebrush	10
				Mountain muhly	5
				Blue grama	5
				Prairie junegrass	5
13*:					
Comodore	Pinyon-Juniper Woodland	Favorable	525	Currant	20
		Normal	475	True mountainmahogany	15
		Unfavorable	350	Indian ricegrass	10
				Bottlebrush squirreltail	10
				Fringed sagebrush	10
				Mountain muhly	5
				Blue grama	5
				Prairie junegrass	5
Rock outcrop.					

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
14*:					
Corlett	Sand Hummocks	Favorable	450	Black greasewood	15
		Normal	300	Rubber rabbitbrush	10
		Unfavorable	200	Fourwing saltbush	10
				Indian ricegrass	10
				Inland saltgrass	10
				Alkali sacaton	10
Hooper	Chico Land	Favorable	1,200	Alkali sacaton	40
		Normal	900	Alkali cordgrass	30
		Unfavorable	600	Inland saltgrass	10
				Black greasewood	10
				Rubber rabbitbrush	10
15---	Sandy Bench	Favorable	900	Indian ricegrass	40
Costilla		Normal	750	Needleandthread	15
		Unfavorable	600	Fourwing saltbush	10
				Thickspike wheatgrass	10
				Spike dropseed	5
				Blue grama	5
				Sand dropseed	5
16---	Deep Sand	Favorable	1,200	Indian ricegrass	40
Cotopaxi		Normal	900	Needleandthread	15
		Unfavorable	500	Creeping wildrye	10
				Blowoutgrass	10
				Spike dropseed	5
				Sand dropseed	5
				Blue grama	5
17---	Salt Flats	Favorable	900	Alkali sacaton	30
Crestvale		Normal	700	Alkali cordgrass	20
		Unfavorable	450	Greasewood	20
				Inland saltgrass	10
				Rubber rabbitbrush	10
				Western wheatgrass	5
				Baltic rush	5
18*:					
Cryaquolls	Mountain Meadow	Favorable	3,500	Tufted hairgrass	35
		Normal	2,500	Sedge	20
		Unfavorable	1,500	Slender wheatgrass	10
				Clover	10
				Willow	5
				Shrubby cinquefoil	5
Histosols	Mountain Meadow	Favorable	4,000	Sedge	60
		Normal	3,500	Tufted hairgrass	15
		Unfavorable	3,000	Reedgrass	5
19---	Mountain Loam (10- to 14-inch precipitation zone).	Favorable	2,400	Idaho fescue	20
Decross		Normal	2,000	Thickspike wheatgrass	15
		Unfavorable	1,400	Antelope bitterbrush	10
				Big sagebrush	10
				Canby bluegrass	10
				Spike fescue	10
				Columbia needlegrass	5
				Mountain brome	5
20---	Mountain Outwash	Favorable	600	Blue grama	25
Derrick		Normal	450	Indian ricegrass	15
		Unfavorable	250	Winterfat	10
				Needleandthread	10
				Bottlebrush squirreltail	5
				Western wheatgrass	5
				Sand dropseed	5
				Fourwing saltbush	5
				Rabbitbrush	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
21---------- Des Moines	Mountain Outwash----------	Favorable Normal Unfavorable	800 600 300	Blue grama---------- Indian ricegrass---------- Western wheatgrass---------- Needleandthread---------- Winterfat---------- Fourwing saltbush---------- Rabbitbrush---------- Bottlebrush squirreltail------	25 15 15 10 10 5 5 5
23---------- Dunul	Mountain Outwash----------	Favorable Normal Unfavorable	600 450 250	Blue grama---------- Indian ricegrass---------- Needleandthread---------- Winterfat---------- Bottlebrush squirreltail------ Sand dropseed---------- Western wheatgrass---------- Rabbitbrush---------- Fourwing saltbush----------	25 15 10 10 5 5 5 5 5
24, 25---------- Garita	Limy Bench----------	Favorable Normal Unfavorable	800 600 400	Winterfat---------- Fourwing saltbush---------- Fringed sagebrush---------- Indian ricegrass---------- Blue grama---------- Rubber rabbitbrush----------	30 15 10 10 10 5
26*: Garita----------	Limy Bench----------	Favorable Normal Unfavorable	800 600 400	Winterfat---------- Fourwing saltbush---------- Fringed sagebrush---------- Indian ricegrass---------- Blue grama---------- Rubber rabbitbrush----------	30 15 10 10 10 5
Platoro----------	Mountain Outwash----------	Favorable Normal Unfavorable	1,000 750 400	Blue grama---------- Indian ricegrass---------- Western wheatgrass---------- Winterfat---------- Needleandthread---------- Bottlebrush squirreltail------ Sand dropseed---------- Fourwing saltbush---------- Rabbitbrush----------	20 15 15 10 10 5 5 5 5
27---------- Gelkie	Mountain Loam (10- to 14-inch precipitation zone).	Favorable Normal Unfavorable	1,000 750 400	Western wheatgrass---------- Needleandthread---------- Arizona fescue---------- Sandberg bluegrass---------- Fringed sagebrush---------- Sedge----------	40 20 15 10 5 5
28---------- Gerrard	Wet Meadow----------	Favorable Normal Unfavorable	3,700 3,100 2,500	Tufted hairgrass---------- Slender wheatgrass---------- Nebraska sedge---------- Bluejoint reedgrass---------- Western wheatgrass---------- Baltic rush----------	30 20 15 10 10 5
29---------- Graypoint	Mountain Outwash----------	Favorable Normal Unfavorable	800 600 300	Blue grama---------- Indian ricegrass---------- Western wheatgrass---------- Winterfat---------- Needleandthread---------- Bottlebrush squirreltail------ Sand dropseed---------- Ring muhly---------- Fourwing saltbush---------- Rabbitbrush----------	25 15 15 10 10 5 5 5 5 5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
30, 31---------- Gunbarrel	Salt Flats----------	Favorable Normal Unfavorable	1,200 900 600	Alkali sacaton---------- Alkali cordgrass---------- Inland saltgrass---------- Rabbitbrush---------- Black greasewood----------	40 30 10 10 10
32---------- Hagga	Salt Meadow----------	Favorable Normal Unfavorable	1,900 1,500 1,100	Alkali sacaton---------- Alkali cordgrass---------- Western wheatgrass---------- Slender wheatgrass---------- Creeping wildrye---------- Nebraska sedge---------- Inland saltgrass---------- Rabbitbrush---------- Black greasewood---------- Baltic rush----------	40 10 10 10 5 5 5 5 5 5
33---------- Hapney	Salt Flats----------	Favorable Normal Unfavorable	900 650 450	Alkali sacaton---------- Alkali cordgrass---------- Black greasewood---------- Baltic rush---------- Inland saltgrass---------- Rubber rabbitbrush---------- Western wheatgrass----------	30 20 20 20 10 10 5
34*: Harlem----------	Salt Flats----------	Favorable Normal Unfavorable	1,000 800 600	Alkali sacaton---------- Alkali cordgrass---------- Beardless wildrye---------- Western wheatgrass---------- Inland saltgrass---------- Rubber rabbitbrush---------- Black greasewood----------	20 15 15 10 10 10 5
Slickspots---------	Chico Land----------	Favorable Normal Unfavorable	550 400 200	Black greasewood---------- Rubber rabbitbrush---------- Inland saltgrass----------	85 10 5
35---------- Hooper	Salt Flats----------	Favorable Normal Unfavorable	1,200 900 600	Alkali sacaton---------- Alkali cordgrass---------- Inland saltgrass---------- Black greasewood---------- Rubber rabbitbrush----------	40 30 10 10 10
36---------- Hooper	Chico Land----------	Favorable Normal Unfavorable	55 550 200	Black greasewood---------- Rubber rabbitbrush---------- Inland saltgrass----------	85 10 5
37*: Hopkins----------	Shallow Loam----------	Favorable Normal Unfavorable	900 750 500	Arizona fescue---------- Mountain muhly---------- Western wheatgrass---------- Letterman needlegrass---------- Pine dropseed---------- Prairie junegrass---------- Snowberry---------- Mountainmahogany----------	30 20 10 10 5 5 5 5
Cheadle----------	Shallow Loam----------	Favorable Normal Unfavorable	2,000 1,700 1,200	Rough fescue---------- Bluebunch wheatgrass---------- Bearded wheatgrass---------- Columbia needlegrass----------	45 20 5 5
Rock outcrop.					

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
39---------- Jodero	Foothill Loam----------	Favorable	1,600	Western wheatgrass----------	50
		Normal	1,200	Needleandthread----------	15
		Unfavorable	800	Fourwing saltbush----------	10
				Sedge----------	5
				Blue grama----------	5
				Rubber rabbitbrush----------	5
40*:					
Jodero----------	Foothill Loam----------	Favorable	1,600	Western wheatgrass----------	50
		Normal	1,200	Needleandthread----------	15
		Unfavorable	800	Sedge----------	10
				Fourwing saltbush----------	10
				Blue grama----------	5
				Rubber rabbitbrush----------	5
Lolo----------	Foothill Loam----------	Favorable	1,600	Western wheatgrass----------	20
		Normal	1,200	Needleandthread----------	10
		Unfavorable	800	Slender wheatgrass----------	10
				Sedge----------	10
				Blue grama----------	5
				Fourwing saltbush----------	5
				Rubber rabbitbrush----------	5
41---------- Kerber	Salt Flats----------	Favorable	900	Alkali sacaton----------	40
		Normal	700	Alkali cordgrass----------	30
		Unfavorable	450	Inland saltgrass----------	10
				Rubber rabbitbrush----------	10
				Rubber rabbitbrush----------	10
42---------- Laney	Salt Flats----------	Favorable	1,100	Alkali sacaton----------	20
		Normal	900	Rubber rabbitbrush----------	15
		Unfavorable	600	Western wheatgrass----------	15
				Inland saltgrass----------	10
				Greasewood----------	10
				Wild licorice----------	5
43, 44---------- Luhon	Limy Bench----------	Favorable	1,000	Winterfat----------	50
		Normal	800	Indian ricegrass----------	15
		Unfavorable	450	Bottlebrush squirreltail----------	15
				Fourwing saltbush----------	10
				Rabbitbrush----------	5
				Blue grama----------	5
45---------- McGinty	Valley Sand----------	Favorable	100	Blue grama----------	20
		Normal	800	Indian ricegrass----------	20
		Unfavorable	600	Alkali sacaton----------	10
				Fourwing saltbush----------	10
				Thickspike wheatgrass----------	10
				Black greasewood----------	5
				Rubber rabbitbrush----------	5
				Needleandthread----------	5
46---------- Medano	Wet Meadow----------	Favorable	2,250	Tufted hairgrass----------	30
		Normal	1,850	Sedge----------	20
		Unfavorable	1,500	Slender wheatgrass----------	15
				Western wheatgrass----------	15
				Baltic rush----------	5
				Bluejoint reedgrass----------	5
47*:					
Medano----------	Wet Meadow----------	Favorable	2,250	Tufted hairgrass----------	30
		Normal	1,850	Sedge----------	20
		Unfavorable	1,500	Slender wheatgrass----------	15
				Western wheatgrass----------	15
				Baltic rush----------	5
				Bluejoint reedgrass----------	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
47*: Hapney	Salt Flats	Favorable	900	Alkali sacaton	30
		Normal	650	Alkali cordgrass	20
		Unfavorable	450	Black greasewood	20
				Baltic rush	20
				Inland saltgrass	10
				Rubber rabbitbrush	10
				Western wheatgrass	5
48 Monte	Mountain Outwash	Favorable	800	Blue grama	25
		Normal	600	Indian ricegrass	15
		Unfavorable	300	Western wheatgrass	15
				Winterfat	10
				Needleandthread	10
				Bottlebrush squirreltail	5
				Sand dropseed	5
				Fendler threeawn	5
				Fourwing saltbush	5
				Rubber rabbitbrush	5
49 Morval	Foothill Loam	Favorable	1,200	Western wheatgrass	20
		Normal	900	Needleandthread	15
		Unfavorable	600	Blue grama	15
				Indian ricegrass	10
				Fourwing saltbush	5
				Winterfat	5
				Big sagebrush	5
				Rabbitbrush	5
50 Mosca	Valley Sand	Favorable	750	Indian ricegrass	20
		Normal	600	Thickspike wheatgrass	10
		Unfavorable	450	Alkali sacaton	10
				Sand dropseed	5
				Alkali cordgrass	5
				Rubber rabbitbrush	5
				Creeping wildrye	5
				Fourwing saltbush	5
51*: Mount Home	Rocky Foothills	Favorable	700	Western wheatgrass	20
		Normal	500	Needleandthread	15
		Unfavorable	300	Indian ricegrass	15
				Pinyon	15
				Blue grama	10
				Thickspike wheatgrass	5
				Sand dropseed	5
				Spike dropseed	5
				Fourwing saltbush	5
				Wax currant	5
Saguache	Mountain Outwash	Favorable	600	Indian ricegrass	15
		Normal	450	Needleandthread	10
		Unfavorable	250	Thickspike wheatgrass	10
				Winterfat	10
				Western wheatgrass	10
				Blue grama	5
				Fourwing saltbush	5
				Rubber rabbitbrush	5
				Bottlebrush squirreltail	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
52---------- Norte	Mountain Outwash----------	Favorable	600	Blue grama----------	20
		Normal	450	Indian ricegrass----------	15
		Unfavorable	250	Western wheatgrass----------	10
				Needleandthread----------	10
				Winterfat----------	10
				Sand dropseed----------	5
				Rabbitbrush----------	5
				Fourwing saltbush----------	5
				Bottlebrush squirreltail------	5
53*:					
Ouray----------	Foothill Sand----------	Favorable	1,200	Scribner needlegrass----------	25
		Normal	1,000	Indian ricegrass----------	15
		Unfavorable	700	Needleandthread----------	10
				Mountainmahogany----------	10
				Pinyon----------	10
				Blue grama----------	5
				Skunkbush sumac----------	5
				Currant----------	5
Sabe----------	Pinyon-Juniper Woodland-------	Favorable	1,000	Scribner needlegrass----------	25
		Normal	800	Indian ricegrass----------	15
		Unfavorable	500	Needleandthread----------	15
				True mountainmahogany---------	10
				Redfruit gooseberry----------	10
				Blue grama----------	5
				Rabbitbrush----------	5
54---------- Parlin	Mountain Loam (10- to 14-inch precipitation zone).	Favorable	1,000	Western wheatgrass----------	30
		Normal	750	Needleandthread----------	20
		Unfavorable	400	Arizona fescue----------	15
				Muttongrass----------	10
				Blue grama----------	10
				Sedge----------	5
				Rabbitbrush----------	5
55, 56---------- Platoro	Mountain Outwash----------	Favorable	1,000	Blue grama----------	20
		Normal	750	Indian ricegrass----------	15
		Unfavorable	400	Western wheatgrass----------	15
				Winterfat----------	10
				Needleandthread----------	10
				Bottlebrush squirreltail------	5
				Sand dropseed----------	5
				Fourwing saltbush----------	5
				Rabbitbrush----------	5
58---------- Rock River	Mountain Outwash----------	Favorable	1,500	Needleandthread----------	25
		Normal	1,200	Thickspike wheatgrass---------	15
		Unfavorable	700	Indian ricegrass----------	10
				Bluebunch wheatgrass----------	10
				Canby bluegrass----------	10
				Big sagebrush----------	10
				Bottlebrush squirreltail------	5
				Low rabbitbrush----------	5
59---------- Rock River	Mountain Outwash----------	Favorable	1,500	Needleandthread----------	25
		Normal	1,200	Thickspike wheatgrass---------	15
		Unfavorable	700	Indian ricegrass----------	10
				Bluebunch wheatgrass----------	10
				Canby bluegrass----------	10
				Big sagebrush----------	10
				Bottlebrush squirreltail------	5
				Low rabbitbrush----------	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
60, 61---------- Saguache	Mountain Outwash----------	Favorable	600	Indian ricegrass----------	15
		Normal	450	Needleandthread----------	10
		Unfavorable	250	Thickspike wheatgrass----------	10
				Winterfat----------	10
				Western wheatgrass----------	10
				Blue grama----------	5
				Fourwing saltbush----------	5
				Rubber rabbitbrush----------	5
				Bottlebrush squirreltail------	5
62---------- San Arcacio	Salt Flats----------	Favorable	1,200	Alkali sacaton----------	50
		Normal	900	Alkali cordgrass----------	20
		Unfavorable	600	Inland saltgrass----------	10
				Black greasewood----------	10
				Rubber rabbitbrush----------	5
63, 64---------- San Luis	Salt Flats----------	Favorable	1,500	Alkali sacaton----------	50
		Normal	1,100	Alkali cordgrass----------	20
		Unfavorable	750	Inland saltgrass----------	10
				Black greasewood----------	10
				Rubber rabbitbrush----------	5
65---------- Schrader	Wet Meadow----------	Favorable	3,000	Tufted hairgrass----------	30
		Normal	2,500	Slender wheatgrass----------	20
		Unfavorable	2,000	Nebraska sedge----------	15
				Western wheatgrass----------	15
				Bluejoint reedgrass----------	10
				Alkali sacaton----------	5
				Baltic rush----------	5
68---------- Sessions	Mountain Loam----------	Favorable	1,600	Arizona fescue----------	30
		Normal	1,400	Bearded wheatgrass----------	20
		Unfavorable	1,000	Mountain muhly----------	10
				Parry oatgrass----------	10
				Western wheatgrass----------	5
				Sandberg bluegrass----------	5
				Big sagebrush----------	5
				Letterman needlegrass----------	5
69---------- Shawa	Foothill Loam----------	Favorable	1,600	Western wheatgrass----------	50
		Normal	1,200	Needleandthread----------	15
		Unfavorable	800	Sedge----------	10
				Blue grama----------	10
				Fourwing saltbush----------	10
				Rubber rabbitbrush----------	5
70---------- Space City	Sandy Bench----------	Favorable	1,200	Indian ricegrass----------	40
		Normal	1,000	Needleandthread----------	15
		Unfavorable	800	Fourwing saltbush----------	10
				Thickspike wheatgrass----------	10
				Spike dropseed----------	5
				Blue grama----------	5
				Winterfat----------	5
71---------- Space City	Valley Sand----------	Favorable	1,000	Indian ricegrass----------	30
		Normal	800	Blue grama----------	20
		Unfavorable	600	Fourwing saltbush----------	10
				Alkali sacaton----------	10
				Needleandthread----------	5
				Creeping wildrye----------	5
				Rabbitbrush----------	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
72*:					
Space City	Valley Sand	Favorable	1,000	Indian ricegrass	30
		Normal	800	Blue grama	20
		Unfavorable	600	Fourwing saltbush	10
				Alkali sacaton	10
				Needleandthread	5
				Creeping wildrye	5
				Rabbitbrush	5
Hooper	Salt Flats	Favorable	1,200	Alkali sacaton	40
		Normal	900	Alkali cordgrass	30
		Unfavorable	600	Inland saltgrass	10
				Black greasewood	10
				Rubber rabbitbrush	10
73*:					
Tolman	Rocky Foothills	Favorable	900	Western wheatgrass	15
		Normal	700	Needleandthread	15
		Unfavorable	400	Pinyon	10
				Indian ricegrass	10
				Blue grama	10
				Gooseberry	10
				Mountainmahogany	10
				Rocky Mountain juniper	5
				Rabbitbrush	5
Rock outcrop.					
74	Wet Meadow	Favorable	3,000	Tufted hairgrass	30
Torsido		Normal	2,400	Slender wheatgrass	20
		Unfavorable	2,000	Nebraska sedge	15
				Western wheatgrass	15
				Bluejoint reedgrass	10
				Baltic rush	5
75*:					
Torsido	Wet Meadow	Favorable	3,000	Tufted hairgrass	30
		Normal	2,400	Slender wheatgrass	20
		Unfavorable	2,000	Nebraska sedge	15
				Western wheatgrass	15
				Bluejoint reedgrass	10
				Baltic rush	5
Gerrard.					
76	Basalt Hills	Favorable	500	Indian ricegrass	50
Travelers		Normal	350	Rabbitbrush	15
		Unfavorable	200	Western wheatgrass	10
				Blue grama	5
				Winterfat	5
77*:					
Travelers	Basalt Hills	Favorable	500	Indian ricegrass	50
		Normal	350	Rabbitbrush	15
		Unfavorable	200	Western wheatgrass	10
				Blue grama	5
				Winterfat	5
Garita	Limy Bench	Favorable	800	Winterfat	30
		Normal	600	Fourwing saltbush	15
		Unfavorable	400	Fringed sagebrush	10
				Indian ricegrass	10
				Blue grama	10
				Rubber rabbitbrush	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
78---------- Uracca	Pinyon-Juniper Woodland-------	Favorable Normal Unfavorable	900 700 400	Western wheatgrass---------- True mountainmahogany--------- Indian ricegrass---------- Pinyon---------- Currant---------- Blue grama---------- Needleandthread----------	20 15 15 15 10 10 10
79---------- Vastine	Wet Meadow----------	Favorable Normal Unfavorable	3,000 2,500 2,000	Tufted hairgrass---------- Slender wheatgrass---------- Sedge---------- Western wheatgrass---------- Bluejoint reedgrass---------- Baltic rush----------	20 20 15 15 10 5
80---------- Vastine	Salt Meadow----------	Favorable Normal Unfavorable	3,100 2,500 1,900	Alkali sacaton---------- Western wheatgrass---------- Alkali cordgrass---------- Slender wheatgrass---------- Nebraska sedge---------- Baltic rush----------	50 15 10 10 5 5
81---------- Villa Grove	Salt Flats----------	Favorable Normal Unfavorable	1,200 900 600	Alkali sacaton---------- Inland saltgrass---------- Alkali cordgrass---------- Rubber rabbitbrush---------- Black greasewood----------	40 30 30 10 10

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
1--- Acasco	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: small stones, wetness, percs slowly.	Moderate: wetness.
2, 3--- Alamosa	Severe: flooding, wetness, excess salt.	Severe: excess salt.	Severe: wetness, flooding.	Moderate: wetness, flooding.
4--- Arena	Severe: flooding, wetness, excess salt.	Severe: excess salt.	Severe: wetness, excess salt.	Moderate: wetness, dusty.
5--- Biedell	Severe: flooding, excess salt, excess sodium.	Severe: excess salt, excess sodium.	Severe: flooding, excess salt, excess sodium.	Moderate: flooding.
6--- Big Blue	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
7*:				
Big Blue---	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Gerrard---	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
8*:				
Big Blue---	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Hagga---	Severe: flooding, wetness, excess sodium.	Severe: wetness, excess sodium, excess salt.	Severe: wetness, excess sodium, excess salt.	Severe: wetness.
9--- Bushvalley	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, depth to rock.	Moderate: large stones, slope.
10*:				
Bushvalley---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: slope.
Gelkie---	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Rock outcrop.				
11*:				
Bushvalley---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: slope.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
11*: Tellura	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope, small stones.	Severe: slope.
12--- Comodore	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: large stones, slope, depth to rock.	Severe: large stones, slope.
13*: Comodore	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: large stones, slope, depth to rock.	Severe: large stones, slope.
Rock outcrop.				
14*: Corlett	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
Hooper	Moderate: percs slowly, excess sodium.	Moderate: excess sodium, percs slowly.	Moderate: percs slowly, excess sodium.	Slight.
15--- Costilla	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
16--- Cotopaxi	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
17--- Crestvale	Severe: excess salt.	Severe: excess salt.	Severe: excess salt.	Moderate: dusty.
18*: Cryaquolls.				
Histosols.				
19--- Decross	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
20--- Derrick	Slight	Slight	Severe: small stones.	Slight.
21--- Des Moines	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
22*. Duneland				
23--- Dunul	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
24--- Garita	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
25--- Garita	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
26*: Garita	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
Platoro	Slight	Slight	Moderate: slope, small stones.	Moderate: dusty.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
27--- Gelkie	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
28--- Gerrard	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
29--- Graypoint	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
30--- Gunbarrel	Slight---	Slight---	Moderate: small stones.	Slight.
31--- Gunbarrel	Severe: excess salt.	Severe: excess salt.	Severe: excess salt.	Moderate: wetness.
32--- Hagga	Severe: flooding, wetness, excess sodium.	Severe: wetness, excess sodium, excess salt.	Severe: wetness, excess sodium, excess salt.	Severe: wetness.
33--- Hapney	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
34*: Harlem---	Severe: flooding.	Moderate: too clayey.	Severe: too clayey.	Moderate: too clayey.
Slickspots.				
35, 36--- Hooper	Moderate: percs slowly, excess sodium.	Moderate: excess sodium, percs slowly.	Moderate: percs slowly, excess sodium.	Slight.
37*: Hopkins---	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.
Cheadle---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.
Rock outcrop.				
38*. Humic Cryaquepts				
39--- Jodero	Slight---	Slight---	Moderate: small stones.	Slight.
40*: Jodero---	Severe: flooding.	Slight---	Severe: wetness.	Slight.
Lolo---	Severe: flooding.	Moderate: wetness, small stones.	Severe: small stones.	Moderate: wetness.
41--- Kerber	Severe: excess salt.	Severe: excess salt.	Severe: excess salt.	Slight.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
42--- Laney	Moderate: percs slowly, dusty.	Moderate: dusty.	Moderate: dusty, percs slowly.	Moderate: dusty.
43--- Luhon	Slight	Slight	Moderate: small stones.	Moderate: dusty.
44--- Luhon	Slight	Slight	Moderate: slope, small stones.	Moderate: dusty.
45--- McGinty	Moderate: excess salt.	Moderate: excess salt.	Moderate: excess salt.	Slight.
46--- Medano	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
47*: Medano	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Hapney	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
48--- Monte	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
49--- Morval	Slight	Slight	Moderate: slope, small stones.	Slight.
50--- Mosca	Slight	Slight	Moderate: small stones.	Slight.
51*: Mount Home	Severe: large stones, small stones.	Severe: large stones, small stones.	Severe: large stones, slope, small stones.	Severe: large stones.
Saguache	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
52--- Norte	Moderate: small stones, excess salt.	Moderate: small stones, excess salt.	Severe: small stones.	Slight.
53*: Ouray	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Sabo	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: large stones.
54--- Parlin	Moderate: small stones, dusty.	Moderate: small stones, dusty.	Severe: small stones.	Moderate: dusty.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
55--Platoro	Slight	Slight	Moderate: small stones.	Moderate: dusty.
56--Platoro	Moderate: large stones, small stones.	Moderate: large stones, small stones.	Severe: large stones, slope, small stones.	Moderate: dusty.
57*. Rock outcrop				
58--Rock River	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: dusty.
59--Rock River	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: dusty.
60--Saguache	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
61--Saguache	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight.
62--San Arcacio	Slight	Slight	Moderate: small stones.	Slight.
63, 64--San Luis	Severe: excess salt.	Severe: excess salt.	Severe: excess salt.	Slight.
65--Schrader	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.
66, 67--Seitz	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
68--Sessions	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
69--Shawa	Slight	Slight	Moderate: slope.	Slight.
70--Space City	Slight	Slight	Moderate: slope.	Slight.
71--Space City	Slight	Slight	Slight	Slight.
72*: Space City	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Hooper	Moderate: percs slowly, excess sodium.	Moderate: excess sodium, percs slowly.	Moderate: percs slowly, excess sodium.	Slight.
73*: Tolman	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: slope.
Rock outcrop.				

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
74---------- Torsido	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
75*: Torsido----------	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
Gerrard----------	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
76---------- Travelers	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones.
77*: Travelers----------	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones.
Garita----------	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.
78---------- Uracca	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
79---------- Vastine	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.
80---------- Vastine	Severe: flooding, excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
81---------- Villa Grove	Moderate: excess salt.	Moderate: excess salt.	Moderate: excess salt.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1---------- Acasco	Fair	Fair	Good	---	Good	Good	Good	Fair	---	Good	Good.
2, 3---------- Alamosa	Fair	Good	Good	---	Good	Good	Good	Fair	---	Good	Good.
4---------- Arena	Fair	Fair	Fair	---	Fair	Fair	Good	Fair	---	Fair	Fair.
5---------- Biedell	Very poor.	Very poor.	Poor	---	Poor	Fair	Fair	Very poor.	---	Fair	Poor.
6---------- Big Blue	Very poor.	Poor	Good	---	Fair	Good	Good	Poor	---	Good	Fair.
7*:											
Big Blue----------	Very poor.	Poor	Good	---	Fair	Good	Good	Poor	---	Good	Fair.
Gerrard----------	Poor	Fair	Good	---	Good	Good	Good	Fair	---	Good	Good.
8*:											
Big Blue----------	Very poor.	Poor	Good	---	Fair	Good	Good	Poor	---	Good	Fair.
Hagga----------	Poor	Fair	Fair	---	Fair	Fair	Good	Fair	---	Fair	Fair.
9---------- Bushvalley	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
10*:											
Bushvalley--------	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Gelkie----------	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Rock outcrop.											
11*:											
Bushvalley--------	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Tellura----------	Very poor.	Poor	Good	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
12---------- Comodore	Very poor.	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
13*:											
Comodore----------	Very poor.	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Rock outcrop.											
14*:											
Corlett----------	Very poor.	Very poor.	Poor	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Hooper----------	Very poor.	Poor	Poor	---	Fair	Fair	Fair	Poor	---	Fair	Poor.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
15--Costilla	Fair	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
16--Cotopaxi	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
17--Crestvale	Fair	Fair	Poor	---	Poor	Poor	Very poor.	Fair	---	Poor	Poor.
18*:											
Cryaquolls.											
Histosols.											
19--Decross	Fair	Fair	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
20--Derrick	Poor	Poor	Good	---	Good	Poor	Very poor.	Poor	---	Very poor.	Good.
21--Des Moines	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
22*. Duneland											
23--Dunul	Poor	Poor	Poor	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
24--Garita	Poor	Poor	Poor	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
25--Garita	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
26*:											
Garita	Poor	Poor	Poor	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
Platoro	Fair	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
27--Gelkie	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
28--Gerrard	Poor	Fair	Good	---	Good	Good	Good	Fair	---	Good	Good.
29--Graypoint	Poor	Poor	Fair	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
30--Gunbarrel	Fair	Fair	Poor	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
31--Gunbarrel	Fair	Fair	Poor	---	Poor	Fair	Fair	Fair	---	Fair	Poor.
32--Hagga	Poor	Fair	Fair	---	Fair	Fair	Good	Fair	---	Fair	Fair.
33--Hapney	Poor	Poor	Poor	---	Fair	Poor	Fair	Poor	---	Poor	Poor.
34*:											
Harlem	Poor	Poor	Very poor.	---	Very poor.	Poor	Very poor.	Poor	---	Very poor.	Very poor.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
34*: Slickspots.											
35--- Hooper	Very poor.	Poor	Poor	---	Fair	Fair	Fair	Poor	---	Fair	Poor.
36--- Hooper	Very poor.	Very poor.	Very poor.	---	Poor	Fair	Fair	Very poor.	---	Fair	Very poor.
37*: Hopkins---	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Cheadle---	Poor	Poor	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Rock outcrop.											
38*. Humic Cryaquepts											
39--- Jodero	Fair	Fair	Fair	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
40*: Jodero---	Poor	Poor	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Lolo---	Poor	Poor	Good	---	Good	Good	Poor	Fair	---	Fair	Good.
41--- Kerber	Fair	Fair	Fair	---	Fair	Fair	Good	Fair	---	Fair	Fair.
42--- Laney	Fair	Fair	Poor	---	Poor	Good	Very poor.	Fair	---	Poor	Poor.
43, 44--- Luhon	Fair	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
45--- McGinty	Fair	Fair	Fair	---	Good	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
46--- Medano	Poor	Fair	Good	---	Fair	Good	Good	Fair	---	Good	Fair.
47*: Medano---	Poor	Fair	Good	---	Fair	Good	Good	Fair	---	Good	Fair.
Hapney---	Poor	Poor	Poor	---	Fair	Poor	Fair	Poor	---	Poor	Poor.
48--- Monte	Fair	Fair	---	---	---	Very poor.	Very poor.	Good	---	Very poor.	---
49--- Morval	Poor	Poor	Good	---	Good	Very poor.	Very poor.	Poor	---	Very poor.	Good.
50--- Mosca	Fair	Fair	Poor	---	Poor	Poor	Very poor.	Fair	---	Very poor.	Poor.
51*: Mount Home---	Very poor.	Very poor.	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Saguache---	Very poor.	Very poor.	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
52---------- Norte	Fair	Fair	Fair	---	Fair	Fair	Fair	Fair	---	Fair	Fair.
53*: Ouray----------	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Sabe----------	Very poor.	Very poor.	Poor	Poor	Fair	---	---	Very poor.	Very poor.	---	Poor.
54---------- Parlin	Poor	Fair	Good	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
55---------- Platoro	Fair	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
56---------- Platoro	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
57*. Rock outcrop											
58, 59---------- Rock River	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
60, 61---------- Saguache	Very poor.	Very poor.	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
62---------- San Arcacio	Fair	Fair	Fair	---	Poor	Poor	Poor	Fair	---	Poor	Fair.
63, 64---------- San Luis	Fair	Fair	Fair	---	Fair	Fair	Good	Fair	---	Fair	---
65---------- Schrader	Fair	Fair	Good	---	Fair	Good	Fair	Fair	---	Fair	---
66---------- Seitz	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	---
67---------- Seitz	Very poor.	Very poor.	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	---
68---------- Sessions	Poor	Poor	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
69---------- Shawa	Fair	Fair	Good	---	Fair	Good	Good	Fair	---	Good	Fair.
70, 71---------- Space City	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
72*: Space City---------	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Hooper----------	Very poor.	Poor	Poor	---	Fair	Fair	Fair	Poor	---	Fair	Poor.
73*: Tolman----------	Very poor.	Very poor.	Fair	---	Good	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Rock outcrop.											
74---------- Torsido	Fair	Fair	Good	---	Poor	Good	Good	Good	---	Good	Fair.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
75*:											
Torsido	Fair	Fair	Good	---	Poor	Good	Good	Good	---	Good	Fair.
Gerrard	Poor	Fair	Good	---	Good	Good	Good	Fair	---	Good	Good.
76--- Travelers	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
77*:											
Travelers	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Garita	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
78--- Uracca	Very poor.	Very poor.	Poor	Poor	Fair	---	---	Very poor.	Very poor.	---	Poor.
79--- Vastine	Fair	Fair	Good	---	Fair	Good	Good	Fair	---	Good	Good.
80--- Vastine	Very poor.	Very poor.	Fair	---	Fair	Fair	Fair	Very poor.	---	Fair	Fair.
81--- Villa Grove	Fair	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition and does not eliminate the need for onsite investigation]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1---------- Acasco	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding, frost action.	Moderate: wetness.
2, 3---------- Alamosa	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Severe: excess salt, flooding.
4---------- Arena	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: excess salt.
5---------- Biedell	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Severe: excess salt, droughty, flooding.
6---------- Big Blue	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
7*: Big Blue----------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Gerrard----------	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Moderate: wetness, flooding, frost action.	Moderate: wetness, droughty.
8*: Big Blue----------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Hagga----------	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, frost action.	Severe: excess salt, excess sodium, wetness.
9---------- Bushvalley	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, thin layer.
10*: Bushvalley--------	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, thin layer.
Gelkie----------	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: large stones, slope.
Rock outcrop.						

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
11*: Bushvalley	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, thin layer.
Tellura	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.
12--- Comodore	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: large stones, slope, thin layer.
13*: Comodore	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: large stones, slope, thin layer.
Rock outcrop.						
14*: Corlett	Severe: cutbanks cave.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
Hooper	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Severe: droughty.
15--- Costilla	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
16--- Cotopaxi	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
17--- Crestvale	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: excess salt.
18*: Cryaquolls.						
Histosols.						
19--- Decross	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
20--- Derrick	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones, droughty.
21--- Des Moines	Moderate: large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: frost action, shrink-swell.	Moderate: small stones, large stones, droughty.
22*. Duneland						
23--- Dunul	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: small stones, large stones.
24--- Garita	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: small stones, large stones.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
25---------- Garita	Moderate: large stones, slope.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.	Moderate: small stones, large stones.
26*: Garita----------	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: slope, large stones.	Moderate: large stones.	Moderate: small stones, large stones.
Platoro----------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Slight.
27---------- Gelkie	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: large stones, slope.
28---------- Gerrard	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Moderate: wetness, flooding, frost action.	Moderate: wetness, droughty.
29---------- Graypoint	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: small stones, large stones, droughty.
30---------- Gunbarrel	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Moderate: frost action.	Severe: droughty.
31---------- Gunbarrel	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Severe: excess salt, droughty.
32---------- Hagga	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, frost action.	Severe: excess salt, excess sodium, wetness.
33---------- Hapney	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: excess sodium.
34*: Harlem----------	Severe: too clayey.	Severe: flooding, shrink-swell, low strength.	Severe: flooding, shrink-swell, low strength.	Severe: flooding, shrink-swell, low strength.	Severe: low strength, shrink-swell.	Severe: too clayey.
Slickspots.						
35, 36---------- Hooper	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Severe: droughty.
37*: Hopkins----------	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: droughty, slope.
Cheadle----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
38*. Humic Cryaquepts						

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
39---- Jodero	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
40*: Jodero	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action, shrink-swell.	Slight.
Lolo	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: large stones, wetness, droughty.
41---- Kerber	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Severe: excess salt.
42---- Laney	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: low strength, shrink-swell.	Severe: excess sodium.
43---- Luhon	Slight	Slight	Slight	Slight	Slight	Slight.
44---- Luhon	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
45---- McGinty	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: excess salt.
46---- Medano	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, frost action.	Severe: wetness.
47*: Medano	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, frost action.	Severe: wetness.
Hapney	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: excess sodium.
48---- Monte	Slight	Slight	Slight	Slight	Slight	Moderate: large stones.
49---- Morval	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action, shrink-swell.	Slight.
50---- Mosca	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
51*: Mount Home	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: slope, large stones.	Severe: large stones.	Severe: small stones, large stones, droughty.
Saguache	Severe: cutbanks cave.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.	Moderate: small stones, large stones, slope.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
52---- Norte	Severe: cutbanks cave.	Slight----	Moderate: wetness.	Slight----	Moderate: frost action.	Moderate: excess salt, small stones, large stones.
53*: Ouray----	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
Sabe----	Severe: cutbanks cave, large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.
54---- Parlin	Moderate: large stones.	Moderate: shrink-swell, large stones.	Moderate: large stones.	Moderate: shrink-swell, large stones.	Moderate: low strength, frost action, shrink-swell.	Moderate: small stones, large stones, droughty.
55---- Platoro	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight----	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
56---- Platoro	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight----	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Moderate: small stones, large stones.
57*. Rock outcrop						
58---- Rock River	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, slope.
59---- Rock River	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
60---- Saguache	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: small stones, large stones.
61---- Saguache	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: slope, large stones.	Moderate: large stones.	Moderate: small stones, large stones.
62---- San Arcacio	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
63, 64---- San Luis	Severe: cutbanks cave, wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.	Severe: excess salt.
65---- Schrader	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
66, 67---- Seitz	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: low strength, slope, large stones.	Severe: large stones, slope.
68---- Sessions	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
69---- Shawa	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
70, 71--- Space City	Severe: cutbanks cave.	Slight---	Slight---	Slight---	Slight---	Severe: droughty.
72*: Space City---	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
Hooper---	Severe: cutbanks cave.	Slight---	Moderate: wetness.	Slight---	Slight---	Severe: droughty.
73*: Tolman---	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: large stones, slope, thin layer.
Rock outcrop.						
74--- Torsido	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
75*: Torsido---	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Gerrard---	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Moderate: wetness, flooding, frost action.	Moderate: wetness, droughty.
76--- Travelers	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: small stones, large stones.
77*: Travelers---	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: small stones, large stones.
Garita---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
78--- Uracca	Severe: cutbanks cave, large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, droughty, slope.
79--- Vastine	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
80--- Vastine	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Severe: excess sodium.
81--- Villa Grove	Slight---	Slight---	Slight---	Slight---	Severe: low strength.	Moderate: excess salt.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition and does not eliminate the need for onsite investigation]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1---------- Acasco	Severe: wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
2, 3---------- Alamosa	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
4---------- Arena	Severe: flooding, cemented pan, wetness.	Severe: cemented pan, flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, cemented pan, wetness.	Poor: area reclaim, wetness.
5---------- Biedell	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding, wetness.	Severe: flooding, wetness, too sandy.	Severe: flooding, wetness.	Poor: seepage, too sandy.
6---------- Big Blue	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
7*: Big Blue----------	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Gerrard----------	Severe: wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
8*: Big Blue----------	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Hagga----------	Severe: wetness, percs slowly.	Severe: flooding, wetness.	Severe: wetness, excess sodium.	Severe: wetness.	Poor: wetness, excess sodium.
9---------- Bushvalley	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
10*: Bushvalley---------	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Gelkie----------	Moderate: percs slowly, slope.	Severe: seepage, slope.	Moderate: slope, too clayey, large stones.	Severe: seepage.	Poor: small stones.
Rock outcrop.					

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
11*:					
Bushvalley	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Tellura	Severe: percs slowly, slope, large stones.	Severe: slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, small stones.
12--- Comodore	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
13*:					
Comodore	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
Rock outcrop.					
14*:					
Corlett	Severe: wetness, poor filter.	Severe: seepage, slope.	Severe: too sandy, excess salt.	Moderate: slope.	Poor: seepage, too sandy.
Hooper	Severe: poor filter.	Severe: seepage.	Severe: wetness, too sandy, excess salt.	Moderate: wetness.	Poor: seepage, too sandy.
15--- Costilla	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy, small stones.
16--- Cotopaxi	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Moderate: slope.	Poor: seepage, too sandy.
17--- Crestvale	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, excess salt.	Severe: wetness.	Fair: too clayey, wetness.
18*:					
Cryaquolls.					
Histosols.					
19--- Decross	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
20--- Derrick	Severe: poor filter.	Severe: seepage.	Severe: too sandy, large stones.	Slight	Poor: seepage, too sandy, small stones.
21--- Des Moines	Severe: percs slowly.	Moderate: large stones.	Severe: large stones.	Slight	Poor: small stones.
22*. Duneland					
23--- Dunul	Severe: poor filter.	Severe: seepage, large stones.	Severe: too sandy, large stones.	Slight	Poor: seepage, too sandy, small stones.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
24---------- Garita	Moderate: percs slowly, large stones.	Moderate: seepage, large stones.	Moderate: large stones.	Slight----------	Poor: small stones.
25---------- Garita	Moderate: percs slowly, slope, large stones.	Severe: slope.	Moderate: slope, large stones.	Moderate: slope.	Poor: small stones.
26*: Garita----------	Moderate: percs slowly, large stones.	Moderate: seepage, slope, large stones.	Moderate: large stones.	Slight----------	Poor: small stones.
Platoro----------	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: too sandy.	Slight----------	Poor: seepage, too sandy, small stones.
27---------- Gelkie	Moderate: percs slowly, slope.	Severe: seepage, slope.	Moderate: slope, too clayey, large stones.	Severe: seepage.	Poor: small stones.
28---------- Gerrard	Severe: wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
29---------- Graypoint	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight----------	Poor: seepage, too sandy, small stones.
30---------- Gunbarrel	Severe: poor filter.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
31---------- Gunbarrel	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
32---------- Hagga	Severe: wetness, percs slowly.	Severe: flooding, wetness.	Severe: wetness, excess sodium.	Severe: wetness.	Poor: wetness, excess sodium.
33---------- Hapney	Severe: percs slowly.	Moderate: wetness.	Severe: wetness, excess sodium.	Moderate: wetness.	Poor: excess sodium.
34*: Harlem----------	Severe: wetness, percs slowly.	Severe: flooding.	Severe: wetness, too clayey.	Moderate: flooding, wetness.	Poor: too clayey.
Slickspots.					
35, 36---------- Hooper	Severe: poor filter.	Severe: seepage.	Severe: wetness, too sandy, excess salt.	Moderate: wetness.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
37*:					
Hopkins	Severe: poor filter, slope, large stones.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
Cheadle	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Rock outcrop.					
38*. Humic Cryaquepts					
39--- Jodero	Moderate: percs slowly.	Moderate: seepage.	Slight---	Slight---	Good.
40*:					
Jodero	Moderate: flooding, percs slowly.	Severe: flooding.	Moderate: flooding.	Moderate: flooding.	Fair: large stones.
Lolo	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: small stones.
41--- Kerber	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: seepage, too sandy, small stones.
42--- Laney	Severe: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too clayey, area reclaim.
43--- Luhon	Moderate: percs slowly.	Moderate: seepage.	Slight---	Slight---	Poor: small stones.
44--- Luhon	Moderate: percs slowly.	Moderate: seepage, slope.	Slight---	Slight---	Poor: small stones.
45--- McGinty	Moderate: wetness.	Severe: seepage.	Severe: wetness.	Moderate: wetness.	Good.
46--- Medano	Severe: wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
47*:					
Medano	Severe: wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Hapney	Severe: percs slowly.	Moderate: wetness.	Severe: wetness, excess sodium.	Moderate: wetness.	Poor: excess sodium.
48--- Monte	Moderate: percs slowly.	Moderate: seepage.	Slight---	Slight---	Good.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
49--- Morval	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight---	Poor: small stones.
50--- Mosca	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight---	Poor: seepage, too sandy, small stones.
51*: Mount Home---	Severe: poor filter, large stones.	Severe: seepage, slope, large stones.	Severe: large stones.	Moderate: slope.	Poor: seepage, large stones.
Saguache---	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Moderate: slope.	Poor: seepage, too sandy, small stones.
52--- Norte	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
53*: Ouray---	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Sabe---	Severe: poor filter, slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
54--- Parlin	Severe: percs slowly.	Moderate: seepage, slope, large stones.	Severe: large stones.	Slight---	Poor: large stones.
55--- Platoro	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: too sandy.	Slight---	Poor: seepage, too sandy, small stones.
56--- Platoro	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: too sandy.	Slight---	Poor: seepage, too sandy, small stones.
57*. Rock outcrop					
58--- Rock River	Moderate: slope.	Severe: seepage, slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
59--- Rock River	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: Slope.	Poor: slope.
60, 61--- Saguache	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight---	Poor: seepage, too sandy, small stones.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
62---------- San Arcacio	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: seepage, too sandy, small stones.
63, 64---------- San Luis	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy, excess salt.	Severe: wetness.	Poor: seepage, too sandy, small stones.
65---------- Schrader	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness.
66, 67---------- Seitz	Severe: percs slowly, slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: large stones, slope.
68---------- Sessions	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
69---------- Shawa	Moderate: wetness, percs slowly.	Moderate: seepage, slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
70, 71---------- Space City	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight----------	Poor: seepage, too sandy.
72*:					
Space City---------	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Moderate: slope.	Poor: seepage, too sandy.
Hooper----------	Severe: poor filter.	Severe: seepage.	Severe: wetness, too sandy, excess salt.	Moderate: wetness.	Poor: seepage, too sandy.
73*:					
Tolman----------	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
Rock outcrop.					
74---------- Torsido	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
75*:					
Torsido----------	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
Gerrard----------	Severe: wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
76--- Travelers	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
77*: Travelers---	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Garita---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
78--- Uracca	Severe: poor filter, slope, large stones.	Severe: scepage, slope, large stones.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, large stones.
79--- Vastine	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
80--- Vastine	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: too sandy, small stones, excess sodium.
81--- Villa Grove	Severe: percs slowly.	Severe: seepage.	Moderate: too clayey.	Severe: seepage.	Fair: too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition and does not eliminate the need for onsite investigation]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1 Acasco	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
2, 3 Alamosa	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
4 Arena	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, excess salt.
5 Biedell	Fair: wetness.	Probable	Improbable: too sandy.	Poor: excess salt, excess sodium.
6 Big Blue	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
7*: Big Blue	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Gerrard	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
8*: Big Blue	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Hagga	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness, excess sodium.
9 Bushvalley	Poor: area reclaim, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
10*: Bushvalley	Poor: area reclaim, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
Gelkie	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Rock outcrop.				
11*: Bushvalley	Poor: area reclaim, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
11*: Tellura	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
12---- Comodore	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
13*: Comodore	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
Rock outcrop.				
14*: Corlett	Good----	Probable----	Improbable: too sandy.	Poor: too sandy.
Hooper	Good----	Probable----	Improbable: too sandy.	Poor: thin layer, excess sodium.
15---- Costilla	Good----	Probable----	Probable----	Poor: small stones, area reclaim.
16---- Cotopaxi	Good----	Probable----	Improbable: too sandy.	Poor: too sandy.
17---- Crestvale	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
18*: Cryaquolls.				
Histosols.				
19---- Decross	Good----	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
20---- Derrick	Fair: large stones.	Improbable: large stones.	Improbable: large stones.	Poor: small stones, area reclaim.
21---- Des Moines	Fair: large stones, shrink-swell.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, area reclaim.
22*. Duneland				
23---- Dunul	Fair: large stones.	Improbable: large stones.	Improbable: large stones.	Poor: small stones, area reclaim.
24, 25---- Garita	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
26*:				
Garita	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Platoro	Good	Probable	Probable	Poor: small stones, area reclaim.
27---- Gelkie	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
28---- Gerrard	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
29---- Graypoint	Good	Probable	Probable	Poor: small stones, area reclaim.
30---- Gunbarrel	Good	Probable	Improbable: too sandy.	Poor: small stones.
31---- Gunbarrel	Fair: wetness.	Probable	Improbable: too sandy.	Poor: small stones, excess salt.
32---- Hagga	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness, excess sodium.
33---- Hapney	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
34*:				
Harlem	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Slickspots.				
35, 36---- Hooper	Good	Probable	Improbable: too sandy.	Poor: thin layer, excess sodium.
37*:				
Hopkins	Poor: large stones.	Improbable: small stones, large stones.	Improbable: large stones.	Poor: small stones, area reclaim, slope.
Cheadle	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
38*. Humic Cryaquepts				
39---- Jodero	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
40*: Jodero	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Lolo	Fair: large stones, wetness.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, area reclaim.
41 Kerber	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim, excess salt.
42 Laney	Fair: low strength, shrink-swell, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium, excess salt, area reclaim.
43, 44 Luhon	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
45 McGinty	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, excess salt.
46 Medano	Poor: wetness.	Probable	Improbable: too sandy.	Poor: thin layer, wetness.
47*: Medano	Poor: wetness.	Probable	Improbable: too sandy.	Poor: thin layer, wetness.
Hapney	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
48 Monte	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: large stones, area reclaim.
49 Morval	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
50 Mosca	Good	Probable	Probable	Poor: small stones, area reclaim.
51*: Mount Home	Poor: large stones.	Improbable: large stones.	Improbable: large stones.	Poor: area reclaim, small stones.
Saguache	Fair: large stones.	Probable	Probable	Poor: small stones, area reclaim.
52 Norte	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
53*: Ouray	Good	Probable	Improbable: too sandy.	Poor: small stones.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
53*: Sabe	Poor: large stones.	Probable	Improbable: too sandy.	Poor: large stones, area reclaim, slope.
54 Parlin	Fair: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim.
55, 56 Platoro	Good	Probable	Probable	Poor: small stones, area reclaim.
57*. Rock outcrop				
58, 59 Rock River	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
60, 61 Saguache	Fair: large stones.	Probable	Probable	Poor: small stones, area reclaim.
62 San Arcacio	Good	Probable	Probable	Poor: small stones, area reclaim.
63, 64 San Luis	Fair: wetness.	Probable	Improbable: too sandy.	Poor: area reclaim, excess salt.
65 Schrader	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
66, 67 Seitz	Poor: low strength, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
68 Sessions	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
69 Shawa	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
70, 71 Space City	Good	Probable	Improbable: too sandy.	Poor: thin layer.
72*: Space City	Good	Probable	Improbable: too sandy.	Poor: thin layer.
Hooper	Good	Probable	Improbable: too sandy.	Poor: thin layer, excess sodium.
73*: Tolman	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
Rock outcrop.				

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
74---------- Torsido	Fair: wetness.	Probable----------	Probable----------	Poor: small stones, area reclaim.
75*: Torsido----------	Fair: wetness.	Probable----------	Probable----------	Poor: small stones, area reclaim.
Gerrard----------	Fair: wetness.	Probable----------	Probable----------	Poor: small stones, area reclaim.
76---------- Travelers	Poor: area reclaim, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
77*: Travelers----------	Poor: area reclaim, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
Garita----------	Fair: large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
78---------- Uracca	Poor: large stones, slope.	Improbable: large stones.	Improbable: large stones.	Poor: large stones, area reclaim, slope.
79---------- Vastine	Fair: wetness.	Probable----------	Improbable: too sandy.	Fair: small stones, thin layer.
80---------- Vastine	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, excess sodium.
81---------- Villa Grove	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, excess salt.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition and does not eliminate the need for onsite investigation]

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
1---------- Acasco	Severe: seepage.	Severe: seepage, wetness.	Severe: slow refill, cutbanks cave.	Percs slowly, cutbanks cave.	Wetness, percs slowly, excess salt.	Wetness, too sandy.
2, 3---------- Alamosa	Moderate: seepage.	Severe: thin layer, wetness.	Severe: slow refill, cutbanks cave.	Flooding, frost action.	Wetness, flooding.	Wetness.
4---------- Arena	Moderate: cemented pan.	Severe: thin layer, wetness.	Severe: slow refill.	Cemented pan, flooding, frost action.	Wetness, cemented pan.	Cemented pan, wetness.
5---------- Biedell	Severe: seepage.	Severe: seepage, excess salt, excess sodium.	Severe: slow refill, salty water, cutbanks cave.	Percs slowly, flooding, frost action.	Wetness, droughty, percs slowly.	Erodes easily, wetness.
6---------- Big Blue	Slight---------	Severe: wetness.	Severe: slow refill.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Wetness, percs slowly.
7*: Big Blue---------	Slight---------	Severe: wetness.	Severe: slow refill.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Wetness, percs slowly.
Gerrard----------	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Large stones, wetness, too sandy.
8*: Big Blue---------	Slight---------	Severe: wetness.	Severe: slow refill.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Wetness, percs slowly.
Hagga----------	Moderate: seepage.	Severe: piping, wetness, excess sodium.	Severe: slow refill.	Frost action, excess salt, excess sodium.	Wetness, excess sodium, excess salt.	Wetness.
9---------- Bushvalley	Severe: depth to rock, slope.	Severe: large stones.	Severe: no water.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.
10*: Bushvalley-------	Severe: depth to rock, slope.	Severe: large stones.	Severe: no water.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.
Gelkie----------	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Soil blowing, slope.	Slope, large stones, soil blowing.
Rock outcrop.						
11*: Bushvalley-------	Severe: depth to rock, slope.	Severe: large stones.	Severe: no water.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.
Tellura----------	Severe: slope.	Severe: large stones.	Severe: no water.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, percs slowly.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
12---------- Comodore	Severe: depth to rock, slope.	Severe: piping, large stones.	Severe: no water.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.
13*: Comodore----------	Severe: depth to rock, slope.	Severe: piping, large stones.	Severe: no water.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.
Rock outcrop.						
14*: Corlett----------	Severe: seepage, slope.	Severe: seepage, piping, excess salt.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.
Hooper----------	Severe: seepage.	Severe: seepage, piping, excess salt.	Severe: slow refill, salty water, cutbanks cave.	Deep to water	Droughty, fast intake, percs slowly.	Erodes easily, too sandy, soil blowing.
15---------- Costilla	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy.
16---------- Cotopaxi	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.
17---------- Crestvale	Moderate: seepage.	Severe: piping, excess salt.	Severe: slow refill, salty water.	Excess salt----	Wetness, excess salt.	Wetness.
18*: Cryaquolls.						
Histosols.						
19---------- Decross	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope----------	Slope, erodes easily.
20---------- Derrick	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty.	Large stones, too sandy.
21---------- Des Moines	Slight---------	Severe: large stones.	Severe: no water.	Deep to water	Large stones, droughty.	Large stones.
22*. Duneland						
23---------- Dunul	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty.	Large stones, too sandy.
24---------- Garita	Moderate: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Large stones, droughty.	Large stones.
25---------- Garita	Severe: slope.	Severe: seepage.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Slope, large stones.
26*: Garita----------	Moderate: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Large stones.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
26*: Platoro	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope	Large stones, too sandy.
27--- Gelkie	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Soil blowing, slope.	Slope, large stones, soil blowing.
28--- Gerrard	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Large stones, wetness, too sandy.
29--- Graypoint	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty	Too sandy.
30--- Gunbarrel	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.
31--- Gunbarrel	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave, excess salt.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.
32--- Hagga	Moderate: seepage.	Severe: piping, wetness, excess sodium.	Severe: slow refill.	Frost action, excess salt, excess sodium.	Wetness, excess sodium, excess salt.	Wetness.
33--- Hapney	Slight	Severe: excess sodium.	Severe: slow refill.	Deep to water	Percs slowly, excess sodium.	Favorable.
34*: Harlem	Slight	Severe: piping.	Severe: slow refill.	Not needed	Slow intake, percs slowly, excess sodium.	Not needed.
Slickspots.						
35--- Hooper	Severe: seepage.	Severe: seepage, piping, excess salt.	Severe: slow refill, salty water, cutbanks cave.	Deep to water	Droughty, fast intake, percs slowly.	Erodes easily, too sandy, soil blowing.
36--- Hooper	Severe: seepage.	Severe: seepage, piping, excess salt.	Severe: slow refill, salty water, cutbanks cave.	Deep to water	Droughty, percs slowly.	Erodes easily.
37*: Hopkins	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Slope, large stones.
Cheadle	Severe: depth to rock, slope.	Severe: large stones.	Severe: no water.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.
Rock outcrop.						
38*. Humic Cryaquepts						
39--- Jodero	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
40*:						
Jodero	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable.
Lolo	Severe: seepage.	Severe: seepage, large stones, wetness.	Moderate: large stones.	Flooding, large stones, slope.	Large stones, wetness, droughty.	Large stones, wetness.
41--Kerber	Severe: seepage.	Severe: seepage.	Severe: cutbanks cave.	Frost action, cutbanks cave, excess salt.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.
42--Laney	Slight	Severe: piping, excess salt.	Severe: no water.	Excess sodium, excess salt.	Excess sodium, excess salt, erodes easily.	Erodes easily, piping.
43--Luhon	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Excess salt	Favorable.
44--Luhon	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, excess salt.	Favorable.
45--McGinty	Severe: seepage.	Severe: piping.	Moderate: deep to water.	Deep to water	Soil blowing, excess salt.	Soil blowing.
46--Medano	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, droughty.	Wetness, too sandy, soil blowing.
47*:						
Medano	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, droughty.	Wetness, too sandy, soil blowing.
Hapney	Slight	Severe: excess sodium.	Severe: slow refill.	Deep to water	Percs slowly, excess sodium.	Favorable.
48--Monte	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable.
49--Morval	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Favorable.
50--Mosca	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.
51*:						
Mount Home	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Slope, large stones.
Saguache	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Large stones, droughty, soil blowing.	Slope, large stones, too sandy.
52--Norte	Severe: seepage.	Severe: seepage.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, excess salt.	Wetness, too sandy.
53*:						
Ouray	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, too sandy.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
53*:						
Sabe	Severe: seepage, slope.	Severe: seepage, piping, large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Slope, large stones, too sandy.
54---------- Parlin	Severe: slope.	Severe: piping, large stones.	Severe: no water.	Deep to water	Large stones, droughty, percs slowly.	Large stones.
55---------- Platoro	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Favorable------	Large stones, too sandy.
56---------- Platoro	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope----------	Large stones, too sandy.
57*. Rock outcrop						
58, 59---------- Rock River	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope----------	Slope.
60, 61---------- Saguache	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Large stones, droughty, soil blowing.	Large stones, too sandy.
62---------- San Arcacio	Severe: seepage.	Severe: seepage.	Severe: cutbanks cave.	Deep to water	Soil blowing---	Too sandy, soil blowing.
63, 64---------- San Luis	Severe: seepage.	Severe: seepage, piping, excess salt.	Severe: slow refill, salty water, cutbanks cave.	Frost action, cutbanks cave.	Wetness, soil blowing.	Wetness, too sandy, soil blowing.
65---------- Schrader	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Flooding, frost action.	Wetness, soil blowing.	Wetness, too sandy, soil blowing.
66---------- Seitz	Severe: slope.	Severe: large stones.	Severe: no water.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones.
67---------- Seitz	Severe: slope.	Severe: large stones.	Severe: no water.	Deep to water	Large stones, percs slowly, slope.	Slope, large stones.
68---------- Sessions	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Percs slowly, slope.	Slope, percs slowly.
69---------- Shawa	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Favorable------	Favorable.
70, 71---------- Space City	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.
72*:						
Space City-------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.
Hooper----------	Severe: seepage.	Severe: seepage, piping, excess salt.	Severe: slow refill, salty water, cutbanks cave.	Deep to water	Droughty, fast intake, percs slowly.	Erodes easily, too sandy, soil blowing.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
73*: Tolman	Severe: depth to rock, slope.	Severe: piping, large stones.	Severe: no water.	Deep to water	Large stones, depth to rock, slope.	Slope, large stones, depth to rock.
Rock outcrop.						
74 Torsido	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness	Large stones, wetness.
75*: Torsido	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness	Large stones, wetness.
Gerrard	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Large stones, wetness, too sandy.
76 Travelers	Severe: depth to rock, slope.	Severe: large stones.	Severe: no water.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.
77*: Travelers	Severe: depth to rock, slope.	Severe: large stones.	Severe: no water.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.
Garita	Severe: slope.	Severe: seepage.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Slope, large stones.
78 Uracca	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Slope, large stones, too sandy.
79 Vastine	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, frost action, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.
80 Vastine	Severe: seepage.	Severe: seepage, piping, excess sodium.	Severe: cutbanks cave.	Flooding, frost action, cutbanks cave.	Wetness, droughty, flooding.	Wetness, too sandy.
81 Villa Grove	Severe: seepage.	Moderate: thin layer.	Severe: no water.	Deep to water	Excess salt	Favorable.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--ENGINEERING INDEX PROPERTIES

[The symbol > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1---------- Acasco	0-9	Clay loam--------	CL	A-6, A-7	0-5	90-100	75-95	70-95	55-80	30-50	10-25
	9-24	Gravelly clay loam, gravelly clay, clay loam.	CH, CL, GC	A-7	0-5	55-100	50-100	45-85	40-70	40-65	20-35
	24-60	Very gravelly sand, gravelly sand.	GP, SP	A-1	0-20	30-75	25-75	15-50	0-5	---	NP
2, 3---------- Alamosa	0-3	Clay loam--------	CL	A-6	0	90-100	80-100	80-90	60-80	30-40	10-15
	3-32	Clay loam, loam, sandy clay loam.	CL	A-6, A-7	0	90-100	80-100	80-100	65-80	35-50	15-25
	32-60	Gravelly loamy sand.	SM, GM	A-1	0-10	55-80	50-75	30-40	10-20	---	NP
4---------- Arena	0-10	Loam----------	CL	A-6	0-5	90-100	75-100	70-90	60-70	30-40	10-20
	10-34	Clay loam, loam	CL	A-6	0-5	90-100	75-100	70-90	60-70	30-40	10-20
	34	Indurated--------	---	---	---	---	---	---	---	---	---
5---------- Biedell	0-3	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	70-80	35-50	20-30
	3-32	Clay, clay loam	CL, CH	A-6, A-7	0	100	100	90-100	70-90	35-60	20-35
	32-60	Sand, gravelly sand.	SP-SM	A-1, A-3, A-2	0-5	75-100	65-100	25-70	5-10	---	NP
6---------- Big Blue	0-5	Clay loam--------	CL-ML, CL	A-4, A-6	0	90-100	90-100	70-95	55-75	25-40	5-15
	5-16	Loam, clay loam	CL	A-6	0	90-100	90-100	70-95	65-80	30-40	10-20
	16-38	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-100	60-85	40-55	15-30
	38-60	Gravelly sandy clay loam.	SC, GC, SM-SC, GM-GC	A-2	0	55-80	50-75	40-60	20-30	25-40	5-15
7*:											
Big Blue--------	0-5	Clay loam--------	CL-ML, CL	A-4, A-6	0	90-100	90-100	70-95	55-75	25-40	5-15
	5-16	Loam, clay loam	CL	A-6	0	90-100	90-100	70-95	65-80	30-40	10-20
	16-38	Clay loam, clay	CL, CH	A-7	0	90-100	90-100	80-100	70-85	40-55	15-30
	38-60	Gravelly sandy clay loam.	SC, GC, SM-SC, GM-GC	A-2	0	55-80	50-75	40-60	20-30	25-40	5-15
Gerrard---------	0-4	Loam----------	ML, CL-ML	A-4	0-5	95-100	75-100	65-95	50-70	20-30	NP-10
	4-12	Loam, gravelly clay loam, gravelly sandy clay loam.	GM-GC, SM-SC, GC, CL	A-2, A-6, A-4	0-10	60-80	50-80	40-70	20-65	25-35	5-15
	12-60	Very gravelly loamy sand, gravelly sand.	GP-GM, GM, SM, SP-SM	A-1	0-20	40-70	30-60	15-45	5-20	---	NP
8*:											
Big Blue--------	0-5	Clay loam--------	CL-ML, CL	A-4, A-6	0	90-100	90-100	70-95	55-75	25-40	5-15
	5-16	Loam, clay loam	CL	A-6	0	90-100	90-100	70-95	65-80	30-40	10-20
	16-38	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-100	60-85	40-55	15-30
	38-60	Gravelly sandy clay loam.	SC, GC, SM-SC, GM-GC	A-2	0	55-80	50-75	40-60	20-30	25-40	5-15
Hagga----------	0-7	Loam----------	CL-ML	A-4	0	100	100	85-95	60-75	20-30	5-10
	7-60	Stratified sandy loam to clay loam.	CL, SC	A-6	0	100	100	65-95	45-80	25-35	10-15

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
9---------- Bushvalley	0-4	Cobbly loam------	CL-ML	A-4	20-30	80-85	75-85	65-75	50-65	25-30	5-10
	4-13	Extremely cobbly clay loam, extremely cobbly sandy clay loam, extremely cobbly loam.	GC, GP-GC	A-2	75-85	15-25	10-20	10-20	5-15	25-40	10-20
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
10*: Bushvalley------	0-4	Cobbly loam------	CL-ML	A-4	20-30	80-85	75-85	65-75	50-65	25-30	5-10
	4-13	Extremely cobbly clay loam, extremely cobbly sandy clay loam, extremely cobbly loam.	GC, GP-GC	A-2	75-85	15-25	10-20	10-20	5-15	25-40	10-20
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Gelkie----------	0-4	Loam----------	SM, ML, SM-SC, CL-ML	A-2, A-4	0-15	75-95	75-90	50-65	25-55	20-30	NP-10
	4-13	Sandy clay loam, clay loam.	SC	A-2, A-6	0-10	75-85	75-80	60-70	25-45	25-35	10-15
	13-24	Gravelly sandy clay loam, gravelly clay loam, sandy clay loam.	GC, SC	A-2	0-20	50-85	50-80	30-60	15-35	25-35	10-15
	24-60	Very gravelly loam, gravelly loam.	SM-SC, GM-GC	A-2, A-4	0-15	40-80	35-75	25-60	25-50	25-30	5-10
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
11*: Bushvalley------	0-4	Cobbly loam------	CL-ML	A-4	20-30	80-85	75-85	65-75	50-65	25-30	5-10
	4-13	Extremely cobbly clay loam, extremely cobbly sandy clay loam, extremely cobbly loam.	GC, GP-GC	A-2	75-85	15-25	10-20	10-20	5-15	25-40	10-20
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Tellura----------	0-13	Very cobbly loam	CL-ML, GM-GC	A-4	15-50	70-90	60-80	55-75	45-60	15-25	5-10
	13-37	Very cobbly clay loam, very cobbly clay.	CL, CH, GC	A-6, A-7	20-50	60-80	45-75	40-70	35-65	35-55	15-30
	37-48	Very cobbly clay loam, extremely cobbly clay loam.	CL-ML, CL, GC, SC	A-4, A-6, A-2	30-65	50-80	40-70	35-65	30-55	25-35	5-15
	48	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
12---------- Comodore	0-15	Very stony loam	ML, CL-ML	A-4	45-75	85-95	80-90	70-80	50-65	20-30	NP-10
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
13*: Comodore--------	0-15	Very stony loam	ML, CL-ML	A-4	45-75	85-95	80-90	70-80	50-65	20-30	NP-10
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
13*:											
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
14*:											
Corlett---------	0-7	Fine sand--------	SM	A-2	0	100	100	70-80	10-20	---	NP
	7-60	Fine sand, sand, loamy sand.	SP-SM, SM	A-3, A-2	0	100	100	70-80	5-15	---	NP
Hooper----------	0-4	Loamy sand-------	SM	A-2	0	100	95-100	50-60	15-25	---	NP
	4-30	Clay, clay loam, gravelly clay loam.	CL, CH	A-6, A-7	0	75-100	70-100	60-100	50-95	30-60	10-30
	30-60	Sand, gravelly sand, very gravelly sand.	SM, SP-SM, GP, GP-GM	A-1, A-3, A-2	0-5	50-100	40-100	25-70	5-20	---	NP
15---------- Costilla	0-10	Gravelly loamy sand.	SM	A-1	0	60-75	50-75	30-50	10-20	---	NP
	10-18	Gravelly loamy sand.	SM	A-1, A-2	0	65-95	50-85	30-60	10-20	---	NP
	18-60	Gravelly sand, gravelly loamy sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	50-95	50-85	20-60	0-15	---	NP
16---------- Cotopaxi	0-7	Sand----------	SP-SM, SM	A-3, A-2	0	90-100	80-100	65-75	5-15	---	NP
	7-60	Sand----------	SP-SM, SP, SM	A-3, A-2	0	85-100	75-100	65-75	0-15	---	NP
17---------- Crestvale	0-30	Loam----------	CL-ML	A-4	0	80-100	75-100	70-100	55-80	20-30	5-10
	30-42	Clay loam, silty clay loam, loam.	CL-ML, CL	A-4, A-6	0	80-100	75-100	70-100	55-85	20-35	5-15
	42-60	Sandy loam, sandy clay loam.	SM, SM-SC	A-2, A-4	0	80-100	75-100	60-80	25-50	15-25	NP-10
18*:											
Cryaquolls.											
Histosols.											
19---------- Decross	0-6	Loam----------	CL	A-6	0	75-100	75-100	65-90	50-75	30-35	10-15
	6-30	Clay loam, loam	CL	A-6	0	75-100	75-100	70-95	60-80	30-40	10-20
	30-60	Loam, clay loam--	ML, CL, CL-ML	A-4	0	75-100	75-100	65-85	50-70	30-35	5-15
20---------- Derrick	0-4	Very gravelly loam.	GM, SM	A-2, A-4, A-1	0-10	25-80	25-75	20-65	15-55	20-25	NP-5
	4-13	Very gravelly clay loam, very gravelly loam, very gravelly sandy clay loam.	GC, SC	A-2, A-6	10-20	40-70	35-65	30-60	25-50	25-40	10-20
	13-60	Extremely gravelly sand, very cobbly sand, gravelly sand.	GP, SP	A-1	10-60	25-70	25-60	10-30	0-5	---	NP
21---------- Des Moines	0-6	Gravelly clay loam.	CL, GC, SC	A-6, A-7	10-15	55-80	55-75	50-70	35-60	35-45	15-25
	6-12	Very gravelly silty clay loam, very gravelly clay loam.	GC	A-2, A-7	5-20	45-60	40-55	35-50	30-45	40-45	20-25
	12-25	Very gravelly sandy clay loam, very cobbly sandy clay loam.	GC	A-2	10-35	45-60	40-55	30-50	20-35	30-35	10-15
	25-60	Extremely cobbly sandy clay loam, extremely gravelly sandy clay loam.	GC	A-2	25-75	25-35	20-30	15-25	10-20	30-35	10-15

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
22*. Duneland											
23---------- Dunul	0-6	Very gravelly sandy loam.	SM, GM	A-1	10-25	60-65	50-60	30-45	15-25	15-25	NP-5
	6-60	Very gravelly sand, very cobbly loamy sand.	SP, GP, SP-SM, GP-GM	A-1	25-55	40-70	25-50	10-30	0-5	---	NP
24, 25---------- Garita	0-9	Gravelly loam----	GC, SC, GM-GC, SM-SC	A-2, A-4, A-6	0-10	50-75	50-70	45-60	30-50	25-35	5-15
	9-60	Very gravelly loam, very gravelly sandy loam.	GM, SM, GM-GC, SM-SC	A-1, A-2	5-30	35-75	20-50	15-45	10-30	15-25	NP-10
26*: Garita----------	0-12	Gravelly loam----	GC, SC, GM-GC, SM-SC	A-2, A-4, A-6	0-10	50-75	50-70	45-60	30-50	25-35	5-15
	12-60	Very gravelly loam, very gravelly sandy loam.	GM, SM, GM-GC, SM-SC	A-1, A-2	5-30	35-75	20-50	15-45	10-30	15-25	NP-10
Platoro---------	0-8	Loam----------	ML	A-4	0-5	90-100	80-100	60-80	50-60	20-35	NP-10
	8-21	Gravelly clay loam, clay loam.	CL	A-6	5-15	60-90	55-85	40-70	35-60	30-35	10-15
	21-33	Very gravelly loam.	GM-GC	A-2, A-4	5-15	35-65	30-60	20-50	15-45	25-30	5-10
	33-60	Very gravelly loamy sand, very gravelly sand, extremely gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	5-25	30-70	20-35	10-25	0-10	---	NP
27---------- Gelkie	0-4	Loam----------	SM, ML, SM-SC, CL-ML	A-2, A-4	0-15	75-95	75-90	50-65	25-55	20-30	NP-10
	4-13	Sandy clay loam, clay loam.	SC	A-2, A-6	0-10	75-85	75-80	60-70	25-45	25-35	10-15
	13-24	Gravelly sandy clay loam, gravelly clay loam, clay loam.	GC, SC	A-2	0-20	50-85	50-80	30-60	15-35	25-35	10-15
	24-60	Very gravelly loam, gravelly loam.	SM-SC, GM-GC	A-2, A-4	0-15	40-80	35-75	25-60	25-50	25-30	5-10
28---------- Gerrard	0-4	Loam----------	ML, CL-ML	A-4	0-5	95-100	75-100	65-95	50-70	20-30	NP-10
	4-12	Loam, clay loam, gravelly sandy clay loam.	GM-GC, SM-SC, GC, CL	A-2, A-6, A-4	0-10	60-80	50-80	40-70	20-65	25-35	5-15
	12-60	Very gravelly loamy sand, gravelly sand.	GP-GM, GM, SM, SP-SM	A-1	0-20	40-70	30-60	15-45	5-20	---	NP

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
29---------- Graypoint	0-4	Gravelly sandy loam.	SM	A-1, A-2	0-10	60-80	55-75	35-50	15-30	20-35	NP-10
	4-13	Gravelly sandy clay loam, sandy clay loam.	SC	A-2, A-6	0-10	60-80	55-80	45-75	20-40	30-40	10-20
	13-60	Gravelly sand, very gravelly sand.	SP, GP	A-1	0-15	25-70	20-60	10-35	0-5	---	NP
30, 31---------- Gunbarrel	0-5	Loamy sand-------	SM	A-2	0	95-100	80-100	50-75	15-30	---	NP
	5-60	Loamy sand, sand.	SP, SP-SM, SM	A-1, A-2, A-3	0-5	90-100	75-100	30-60	0-20	---	NP
32---------- Hagga	0-7	Loam----------	CL-ML	A-4	0	100	100	85-95	60-75	20-30	5-10
	7-60	Stratified sandy loam to clay loam.	CL, SC	A-6	0	100	100	65-95	45-80	25-35	10-15
33---------- Hapney	0-2	Clay loam--------	CL, CH	A-6, A-7	0	100	100	90-100	70-95	30-60	10-30
	2-20	Clay, clay loam	CH, CL	A-6, A-7	0	100	100	90-100	70-95	35-60	15-35
	20-34	Clay----------	CL, CH	A-7	0	100	100	90-100	70-95	40-55	20-35
	34-60	Sandy clay loam, clay loam.	CL, SC	A-6	0	100	100	80-90	35-55	20-40	10-20
34*: Harlem----------	0-9	Clay----------	CL, CH	A-7	0	100	100	90-100	80-95	40-65	20-40
	9-52	Stratified clay loam to silty clay.	CL, CH	A-7	0	100	100	95-100	75-95	40-55	20-35
	52-60	Stratified loam to silty clay loam.	CL	A-6	0	100	100	80-90	65-85	25-40	10-20
Slickspots.											
35---------- Hooper	0-4	Loamy sand-------	SM	A-2	0	100	95-100	50-60	15-25	---	NP
	4-30	Clay, clay loam, gravelly clay loam.	CL, CH	A-6, A-7	0	75-100	70-100	60-100	50-95	30-60	10-30
	30-60	Sand, gravelly sand, very gravelly sand.	SM, SP-SM, GP, GP-GM	A-1, A-3, A-2	0-5	50-100	40-100	25-70	5-20	---	NP
36---------- Hooper	0-4	Clay loam--------	CL	A-6	0	100	100	90-100	70-95	30-40	10-20
	4-30	Clay, clay loam, gravelly clay loam.	CL, CH	A-6, A-7	0	75-100	70-100	60-100	50-95	30-60	10-30
	30-60	Sand, gravelly sand, very gravelly sand.	SM, SP-SM, GP, GP-GM	A-1, A-3, A-2	0-5	50-100	40-100	25-70	5-20	---	NP
37*: Hopkins----------	0-15	Channery loam----	ML, GM, CL, GC	A-6, A-4	0-20	50-75	50-75	45-70	35-60	30-40	5-15
	15-60	Fragmental material.	GP	A-1	50-85	0-5	0-5	0-5	0	---	NP
Cheadle----------	0-9	Channery loam----	GM-GC, GM, SM, ML	A-4	10-15	70-90	60-80	50-75	40-65	15-30	NP-10
	9-15	Extremely flaggy loam, very channery loam, very stony sandy loam.	GM, GM-GC	A-4, A-2, A-1	25-50	40-65	30-55	25-50	15-45	15-30	NP-10
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
38*. Humic Cryaquepts											
39---------- Jodero	0-6	Loam----------	ML	A-4	0-5	95-100	80-100	70-95	50-75	30-40	5-10
	6-60	Stratified loam to loamy sand.	ML, SM	A-4	0-5	95-100	80-100	70-90	45-65	20-35	NP-10
40*:											
Jodero----------	0-6	Loam----------	ML, CL-ML	A-4	0-5	95-100	90-100	75-95	55-75	20-30	NP-10
	6-60	Stratified loam to loamy sand.	ML, SM	A-4	0-5	95-100	80-100	70-90	45-65	20-35	NP-10
Lolo----------	0-8	Gravelly sandy loam.	SM	A-4	0-15	70-85	60-75	50-65	35-50	20-35	NP-10
	8-25	Gravelly loam, very gravelly sandy loam, cobbly sandy loam.	GM, SM	A-2, A-1, A-4	0-25	45-80	35-75	25-60	20-50	20-35	NP-10
	25-37	Very gravelly loam, very cobbly sandy loam.	GM	A-1, A-2	15-65	35-50	25-40	20-35	15-30	20-35	NP-10
	37-60	Very gravelly sandy loam, extremely cobbly sandy loam.	GM, GM-GC	A-1, A-2	15-65	36-50	25-40	20-35	15-30	20-30	NP-10
41---------- Kerber	0-8	Loamy sand-------	SM	A-2	0	90-100	75-100	50-75	15-30	---	NP
	8-27	Sandy loam, loamy sand.	SM	A-2	0	90-100	75-100	50-75	25-35	---	NP
	27-60	Gravelly sand, sand.	SP, SP-SM, SM	A-1, A-2, A-3	0-5	60-100	50-90	45-70	0-15	---	NP
42---------- Laney	0-8	Loam----------	ML	A-4	0-5	90-100	90-100	70-90	50-80	20-30	NP-5
	8-50	Stratified clay loam to fine sandy loam.	CL, CL-ML	A-4, A-6	0-5	90-100	90-100	65-95	50-70	20-35	5-15
43, 44---------- Luhon	0-7	Loam----------	ML	A-4	0-5	80-100	80-100	65-95	50-70	15-25	NP-5
	7-60	Loam, sandy loam, gravelly loam.	ML, GM	A-4	0-10	55-100	50-95	35-90	35-75	25-35	NP-10
45---------- McGinty	0-17	Sandy loam-------	SM	A-2, A-4	0	95-100	90-100	60-70	30-40	20-30	NP-5
	17-60	Sandy loam, fine sandy loam.	SM	A-2, A-4	0	80-100	75-100	55-70	30-40	20-30	NP-5
46---------- Medano	0-19	Fine sandy loam	SM, ML	A-4	0	90-100	90-100	70-85	40-55	25-40	NP-10
	19-60	Loamy sand, coarse sand, loamy fine sand.	SM, SP-SM	A-2, A-3	0	90-100	90-100	55-70	5-30	---	NP
47*:											
Medano----------	0-19	Fine sandy loam	SM, ML	A-4	0	90-100	90-100	70-85	40-55	25-40	NP-10
	19-60	Loamy sand, coarse sand, loamy fine sand.	SM, SP-SM	A-2, A-3	0	90-100	90-100	55-70	5-30	---	NP
Hapney----------	0-2	Clay loam--------	CL, CH	A-6, A-7	0	100	100	90-100	70-95	30-60	10-30
	2-20	Clay, clay loam	CH, CL	A-6, A-7	0	100	100	90-100	70-95	35-60	15-35
	20-34	Clay----------	CL, CH	A-7	0	100	100	90-100	70-95	40-55	20-35
	34-60	Sandy clay loam, clay loam.	CL, SC	A-6	0	100	100	80-90	35-55	20-40	10-20

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
48---------- Monte	0-12	Loam----------	ML	A-4	0-10	95-100	90-100	75-95	55-75	30-40	5-10
	12-60	Stratified loam to sandy loam.	ML, SM	A-4	0-10	95-100	90-100	65-95	45-75	30-40	5-10
49---------- Morval	0-5	Clay loam--------	CL	A-6	0-5	90-100	85-100	80-95	55-75	30-40	15-25
	5-27	Loam, clay loam	SC, CL	A-6	0-10	75-100	70-95	60-85	35-70	30-40	10-25
	27-60	Gravelly clay loam, clay loam.	GC, SC, CL	A-6	5-10	55-75	55-70	40-65	35-55	25-35	10-20
50---------- Mosca	0-8	Loamy sand-------	SM	A-2	0	90-100	75-100	50-75	15-30	---	NP
	8-32	Sandy loam, loamy sand.	SM	A-2	0	90-100	75-100	50-75	25-35	---	NP
	32-60	Gravelly sand, sand, very gravelly sand.	SP, SP-SM	A-1, A-3, A-2	0-5	60-100	40-90	35-70	0-10	---	NP
51*:											
Mount Home------	0-16	Very cobbly sandy loam.	GM, GM-GC	A-1	25-55	40-50	35-45	30-40	10-25	20-30	NP-10
	16-60	Very cobbly sandy loam, very stony sandy loam, extremely cobbly sandy loam.	GP-GM, GM	A-1	40-65	35-50	35-45	20-35	5-15	20-25	NP-5
Saguache--------	0-8	Gravelly sandy loam.	SM-SC, SM	A-4, A-2	0-10	75-100	50-100	40-75	25-45	15-30	NP-10
	8-60	Very gravelly sand, very cobbly sand, very gravelly loamy sand.	GP, GP-GM	A-1	10-40	25-50	25-50	10-30	0-10	---	NP
52---------- Norte	0-8	Gravelly sandy loam.	SM	A-1, A-2	0-10	60-90	50-70	30-50	10-30	20-30	NP-5
	8-26	Gravelly sandy loam, sandy loam.	SM	A-1, A-2	0-5	60-85	55-80	30-60	15-35	20-25	NP-5
	26-60	Very gravelly loamy sand, very gravelly sand.	SP, SP-SM	A-1	0-5	60-80	20-50	10-40	0-10	---	NP
53*:											
Ouray----------	0-13	Loamy sand-------	SM	A-2	0	90-100	75-100	50-75	15-30	---	NP
	13-60	Loamy sand, sand	SM, SP-SM	A-1, A-2, A-3	0-10	85-95	75-85	35-55	5-20	---	NP
Sabe----------	0-7	Very stony sandy loam.	SM	A-1, A-2, A-4	30-70	60-80	50-75	40-70	10-45	15-20	NP-5
	7-48	Very gravelly sandy loam, very gravelly sandy clay loam, very cobbly sandy loam.	SM, SP-SM	A-1, A-2, A-4	15-70	60-80	50-75	40-70	15-40	20-30	NP-10
	48-60	Sand, stony sand	SM, SP-SM	A-2, A-3	5-25	85-100	75-100	60-75	5-15	---	NP

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
54---------- Parlin	0-8	Gravelly loam----	SM, GM	A-4	5-20	65-75	60-70	55-60	40-55	20-30	NP-5
	8-20	Gravelly clay loam, cobbly clay loam.	CL	A-6, A-7	5-30	70-80	65-75	60-70	50-60	30-50	10-25
	20-60	Cobbly loam, stony loam, extremely flaggy clay loam.	CL-ML, SM-SC, CL, SC	A-6, A-4	40-80	75-85	70-80	65-70	40-55	20-35	5-15
55---------- Platoro	0-8	Loam----------	ML	A-4	0-5	90-100	80-100	60-80	50-60	20-35	NP-10
	8-21	Gravelly clay loam, clay loam.	CL	A-6	5-15	60-90	55-85	40-70	35-60	30-35	10-15
	21-33	Very gravelly loam.	GM-GC	A-2, A-4	5-15	35-65	30-60	20-50	15-45	25-30	5-10
	33-60	Very gravelly loamy sand, very gravelly sand, extremely gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	5-25	30-70	20-35	10-25	0-10	---	NP
56---------- Platoro	0-8	Cobbly loam------	ML, CL-ML	A-4	10-25	85-100	70-90	65-85	50-65	20-30	NP-10
	8-39	Gravelly clay loam, clay loam, gravelly loam.	CL, GC, SC	A-6	0-20	70-100	65-80	60-80	45-60	25-35	10-15
	39-60	Very gravelly loamy sand, very gravelly sand.	GP, GP-GM	A-1	5-25	30-50	20-35	10-25	0-10	---	NP
57*---------- Rock outcrop	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
58, 59---------- Rock River	0-6	Gravelly loam----	CL, CL-ML, SC, SM-SC	A-4, A-6	0-5	80-100	60-75	50-65	45-65	15-30	5-15
	6-30	Sandy clay loam, gravelly sandy clay loam.	SM, SM-SC	A-4	0-5	90-100	70-100	60-90	35-45	15-25	NP-10
	30-60	Gravelly loam, gravelly sandy loam.	ML, CL-ML, SM, SM-SC	A-4	0-5	80-95	70-80	55-75	40-60	15-25	NP-10
60, 61---------- Saguache	0-8	Gravelly sandy loam.	SM-SC, SM	A-4, A-2	0-10	75-100	50-100	40-75	25-45	15-30	NP-10
	8-60	Very gravelly sand, very cobbly sand, very gravelly loamy sand.	GP, GP-GM	A-1	10-40	25-50	25-50	10-30	0-10	---	NP
62---------- San Arcacio	0-5	Sandy loam-------	SM	A-2, A-4	0	80-100	75-95	50-65	25-50	20-25	NP-5
	5-25	Sandy clay loam, sandy loam.	SC	A-6	0	80-100	75-95	60-85	35-50	20-30	10-15
	25-60	Very gravelly sand.	GP, GP-GM	A-1	0-5	30-50	20-50	15-30	0-10	---	NP
63, 64---------- San Luis	0-10	Sandy loam-------	SM	A-2, A-4	0	100	100	60-70	30-45	15-20	NP-5
	10-37	Clay loam, sandy clay loam, loam.	CL, SC	A-6	0	100	100	80-95	35-80	30-40	10-20
	37-60	Sand, loamy sand, very gravelly sand.	SM, SP-SM	A-1, A-3, A-2	0-10	75-100	45-100	35-65	5-20	---	NP
65---------- Schrader	0-8	Sandy loam-------	SM	A-2, A-4	0	80-100	75-100	60-70	30-40	---	NP
	8-60	Stratified gravelly sand to loam.	SM, ML	A-4	0-5	80-100	75-100	75-90	35-60	15-20	NP-5

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
66---------- Seitz	0-4	Very stony loam	ML, GM, CL-ML, GM-GC	A-4	45-75	70-85	65-80	50-75	40-65	20-30	NP-10
	4-28	Very stony clay, extremely stony clay, very stony clay loam.	CH	A-7	45-75	70-85	65-80	55-80	50-75	50-60	30-35
	28-60	Extremely stony clay loam, very stony clay loam.	CL	A-7	50-80	70-85	65-80	60-80	50-65	40-50	15-25
67---------- Seitz	0-12	Very stony loam	ML, CL-ML	A-4	45-75	75-90	70-85	60-75	50-65	20-30	NP-10
	12-28	Very stony clay loam, very stony clay.	CL, CH	A-7	45-75	70-85	65-80	55-80	50-75	40-55	20-30
	28-60	Extremely stony clay loam.	CL	A-7, A-6	50-80	70-85	65-80	60-80	50-65	35-50	15-25
68---------- Sessions	0-14	Loam----------	CL-ML, CL	A-4, A-6	0-10	90-100	85-100	65-90	50-75	25-35	5-15
	14-51	Clay, gravelly clay, clay loam.	CH, CL	A-6, A-7	0-15	75-100	70-95	70-95	60-90	45-60	25-40
	51-60	Clay loam, clay, gravelly clay loam.	CL, CH	A-6, A-7	0-15	80-100	70-95	60-90	55-85	35-55	15-30
69---------- Shawa	0-13	Loam----------	ML, CL-ML	A-4	0	100	90-100	75-95	55-75	25-35	NP-10
	13-53	Clay loam, silty clay loam.	CL	A-6	0	95-100	90-100	75-95	55-85	30-40	10-20
	53-60	Loam, clay loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	75-95	55-85	25-40	15-20
70, 71---------- Space City	0-8	Loamy sand-------	SM	A-2, A-4	0	100	95-100	80-95	20-40	---	NP
	8-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-4, A-3	0	100	95-100	75-90	5-40	---	NP
72*:											
Space City------	0-8	Loamy sand-------	SM	A-2, A-4	0	100	95-100	80-95	20-40	---	NP
	8-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-4, A-3	0	100	95-100	75-90	5-40	---	NP
Hooper----------	0-4	Loamy sand-------	SM	A-2	0	100	95-100	50-60	15-25	---	NP
	4-30	Clay, clay loam, gravelly clay loam.	CL, CH	A-6, A-7	0	75-100	70-100	60-100	50-95	30-60	10-30
	30-60	Sand, gravelly sand, very gravelly sand.	SM, SP-SM, GP, GP-GM	A-1, A-3, A-2	0-5	50-100	40-100	25-70	5-20	---	NP
73*:											
Tolman----------	0-4	Very stony loam	CL-ML, CL, SC, SM-SC	A-4, A-6	10-40	80-95	60-90	55-85	45-65	15-30	5-15
	4-10	Very cobbly clay loam, cobbly clay loam, stony clay loam.	CL	A-6	10-40	85-95	70-90	65-90	55-70	20-30	10-15
	10-13	Extremely stony loam, extremely stony clay loam, very stony clay loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	15-45	85-95	70-80	60-80	40-65	15-30	5-15
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
74---------- Torsido	0-8	Loam----------	CL-ML	A-4	0-5	90-100	85-100	70-95	50-70	20-30	5-10
	8-23	Clay loam--------	CL, SC	A-6	0-5	80-95	75-90	70-90	45-70	25-40	10-20
	23-60	Very gravelly sand, very gravelly loamy sand.	GP, GP-GM, SP, SP-SM	A-1	10-25	50-70	30-60	10-30	0-10	---	NP
75*: Torsido----------	0-8	Loam----------	CL-ML	A-4	0-5	90-100	85-100	70-95	50-70	20-30	5-10
	8-23	Clay loam--------	CL, SC	A-6	0-5	80-95	75-90	70-90	45-70	25-40	10-20
	23-60	Very gravelly sand, very gravelly loamy sand.	GP, GP-GM, SP, SP-SM	A-1	10-25	50-70	30-60	10-30	0-10	---	NP
Gerrard----------	0-4	Loam----------	ML, CL-ML	A-4	0-5	95-100	75-100	65-95	50-70	20-30	NP-10
	4-12	Loam, gravelly clay loam, gravelly sandy clay loam.	GM-GC, SM-SC, GC, CL	A-2, A-6, A-4	0-10	60-80	50-80	40-70	20-65	25-35	5-15
	12-60	Very gravelly loamy sand, gravelly sand.	GP-GM, GM, SM, SP-SM	A-1	0-20	40-70	30-60	15-45	5-20	---	NP
76---------- Travelers	0-4	Very stony loam	GM, SM, ML, CL-ML	A-1, A-2, A-4	25-60	25-85	25-85	25-65	20-55	25-35	NP-10
	4-13	Very gravelly loam, very cobbly loam, very stony loam.	GM, SM, GM-GC, SM-SC	A-1, A-2, A-4	10-60	40-70	35-60	25-50	20-40	25-35	NP-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
77*: Travelers-------	0-4	Very stony loam	GM, SM, ML, CL-ML	A-1, A-2, A-4	25-60	25-85	25-85	25-65	20-55	25-35	NP-10
	4-13	Very gravelly loam, very cobbly loam, very stony loam.	GM, SM, GM-GC, SM-SC	A-1, A-2, A-4	10-60	40-70	35-60	25-50	20-40	25-35	NP-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Garita----------	0-9	Gravelly loam----	GC, SC, GM-GC, SM-SC	A-2, A-4, A-6	0-10	50-75	50-70	45-60	30-50	25-35	5-15
	9-60	Very gravelly loam, very gravelly sandy loam.	GM, SM, GM-GC, SM-SC	A-1, A-2	5-30	35-75	20-50	15-45	10-30	15-25	NP-10
78---------- Uracca	0-4	Very cobbly loam	ML, SM	A-4	40-65	75-90	70-80	60-75	40-60	20-30	NP-5
	4-36	Extremely cobbly sandy clay loam, very cobbly clay loam, extremely cobbly loam.	SC, SM-SC, GM, GM-GC	A-2, A-4, A-6	40-75	65-90	50-85	40-70	30-50	25-35	5-15
	36-60	Very cobbly sandy loam, extremely cobbly sandy loam.	GP-GM, GM	A-1	30-85	20-50	20-50	15-35	5-20	---	NP

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
79---------- Vastine	0-8	Loam----------	CL, CL-ML	A-4, A-6	0	100	95-100	75-90	50-70	25-35	5-15
	8-22	Loam, sandy clay loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	75-90	50-70	25-35	5-15
	22-60	Sand, loamy sand, gravelly loamy sand.	SM, SP-SM	A-1, A-2	0	95-100	65-95	40-70	10-25	---	NP
80---------- Vastine	0-24	Loam----------	CL-ML, CL	A-4, A-6	0	95-100	90-100	75-90	50-70	20-35	5-15
	24-60	Gravelly sand, gravelly loamy sand, sand.	GM, SM	A-1, A-2	0-5	55-100	50-95	35-65	10-25	---	NP
81---------- Villa Grove	0-8	Sandy clay loam	CL, SC	A-6	0	100	95-100	70-90	35-55	25-40	10-25
	8-32	Clay loam, sandy clay loam.	CL, SC	A-6	0	100	75-100	60-95	45-70	30-40	15-25
	32-60	Sandy loam, loam, gravelly sandy loam.	SM-SC, CL-ML	A-2, A-4	0	100	65-100	50-70	20-55	20-30	5-10

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
1----------	0-9	27-40	0.06-0.6	0.18-0.21	6.6-8.4	<8	High------	0.24	3	4	2-4
Acasco	9-24	35-60	0.06-0.2	0.17-0.20	6.6-8.4	<4	High------	0.15			
	24-60	0-5	>20	0.04-0.06	6.6-7.3	<2	Low-------	0.05			
2, 3----------	0-3	27-40	0.2-0.6	0.18-0.20	6.6-8.4	2-16	Moderate	0.28	5	6	2-5
Alamosa	3-32	18-35	0.2-0.6	0.18-0.20	7.4-8.4	2-16	Moderate	0.28			
	32-60	0-5	6.0-20.0	0.04-0.07	7.4-8.4	<16	Low-------	0.05			
4----------	0-10	15-27	0.2-0.6	0.14-0.17	7.9-9.0	2-16	Low-------	0.24	2	4L	.5-1
Arena	10-34	18-35	0.2-0.6	0.14-0.17	>8.4	8-16	Low-------	0.24			
	34	---	---	---	---	---	----------	----			
5----------	0-3	28-34	<0.06	0.04-0.06	>9.0	>8	High------	0.28	3	4	.5-1
Biedell	3-32	35-50	<0.06	0.04-0.06	>9.0	>8	High------	0.37			
	32-60	0-5	6.0-20	0.03-0.05	>9.0	<4	Low-------	0.05			
6----------	0-5	27-35	0.2-0.6	0.16-0.20	7.9-9.0	<4	Moderate	0.24	5	5	2-5
Big Blue	5-16	25-40	0.2-0.6	0.14-0.18	7.9-9.0	<2	Moderate	0.24			
	16-38	35-50	0.20-0.6	0.14-0.16	7.4-8.4	<2	High------	0.24			
	38-60	20-35	0.6-2.0	0.10-0.13	7.4-8.4	<2	Low-------	0.10			
7*:											
Big Blue-------	0-5	27-35	0.2-0.6	0.16-0.20	7.9-9.0	<4	Moderate	0.24	5	5	2-5
	5-16	25-40	0.2-0.6	0.14-0.18	7.9-9.0	<2	Moderate	0.24			
	16-38	35-50	0.20-0.6	0.14-0.16	7.4-8.4	<2	High------	0.24			
	38-60	20-35	0.6-2.0	0.10-0.13	7.4-8.4	<2	Low-------	0.10			
Gerrard-------	0-4	15-25	0.6-2.0	0.16-0.18	6.1-7.8	<2	Low-------	0.28	2	6	2-4
	4-12	20-35	0.6-2.0	0.15-0.18	6.1-7.8	<2	Moderate	0.24			
	12-60	2-5	6.0-20	0.05-0.07	6.6-7.3	<2	Low-------	0.10			
8*:											
Big Blue-------	0-5	27-35	0.2-0.6	0.16-0.20	7.9-9.0	<4	Moderate	0.24	5	5	2-5
	5-16	25-40	0.2-0.6	0.14-0.18	7.9-9.0	<2	Moderate	0.24			
	16-38	35-50	0.20-0.6	0.14-0.16	7.4-8.4	<2	High------	0.24			
	38-60	20-35	0.6-2.0	0.10-0.13	7.4-8.4	<2	Low-------	0.10			
Hagga----------	0-7	15-27	0.6-2.0	0.12-0.16	7.9-9.0	4-16	Low-------	0.24	5	4	1-2
	7-60	18-35	0.2-0.6	0.12-0.18	7.9-9.0	4-16	Moderate	0.24			
9----------	0-4	15-25	0.6-2.0	0.12-0.15	6.1-7.8	<2	Low-------	0.24	1	---	2-3
Bushvalley	4-13	18-35	0.2-0.6	0.04-0.07	6.1-7.8	<2	Low-------	0.10			
	13	---	---	---	---	---	----------	----			
10*:											
Bushvalley------	0-4	15-25	0.6-2.0	0.12-0.15	6.1-7.8	<2	Low-------	0.24	1	---	2-3
	4-13	18-35	0.2-0.6	0.04-0.07	6.1-7.8	<2	Low-------	0.10			
	13	---	---	---	---	---	----------	----			
Gelkie----------	0-4	10-20	2.0-6.0	0.10-0.13	6.6-7.8	<2	Low-------	0.15	5	3	2-3
	4-13	20-35	0.6-2.0	0.14-0.16	6.6-7.8	<2	Moderate	0.20			
	13-24	20-35	0.6-2.0	0.10-0.13	6.6-8.4	<2	Moderate	0.20			
	24-60	15-25	0.6-2.0	0.10-0.13	7.9-8.4	<2	Low-------	0.10			
Rock outcrop.											
11*:											
Bushvalley------	0-4	15-25	0.6-2.0	0.12-0.15	6.1-7.8	<2	Low-------	0.24	1	---	2-3
	4-13	18-35	0.2-0.6	0.04-0.07	6.1-7.8	<2	Low-------	0.10			
	13	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
11*:											
Tellura	0-13	20-26	0.6-2.0	0.10-0.13	6.1-7.8	<2	Low	0.15	5	8	2-4
	13-37	35-50	0.06-0.2	0.08-0.10	6.1-7.8	<2	Moderate	0.17			
	37-48	28-40	0.2-2.0	0.06-0.09	6.1-7.8	<2	Moderate	0.15			
	48	---	---	---	---	---	---	---			
12	0-15	18-27	0.6-2.0	0.08-0.10	6.1-6.5	<2	Low	0.17	1	8	2-4
Comodore	15	---	---	---	---	---	---	---			
13*:											
Comodore	0-15	18-27	0.6-2.0	0.08-0.10	6.1-6.5	<2	Low	0.17	1	8	2-4
	15	---	---	---	---	---	---	---			
Rock outcrop.											
14*:											
Corlett	0-7	1-6	6.0-20	0.04-0.06	>8.4	<4	Low	0.10	5	1	<.5
	7-60	1-5	6.0-20	0.04-0.06	>8.4	>4	Low	0.10			
Hooper	0-4	0-5	2.0-6.0	0.06-0.08	>9.0	<4	Low	0.17	3	2	.5-1
	4-30	35-55	<0.06	0.04-0.06	>9.0	4-8	High	0.37			
	30-60	0-5	6.0-20	0.03-0.05	>9.0	<4	Low	0.05			
15	0-10	4-7	2.0-6.0	0.05-0.07	7.4-7.8	<2	Low	0.05	5	2	<.5
Costilla	10-18	4-8	2.0-6.0	0.05-0.07	7.4-8.4	<2	Low	0.05			
	18-60	0-5	2.0-6.0	0.04-0.07	7.9-8.4	<2	Low	0.05			
16	0-7	2-6	6.0-20	0.04-0.06	7.4-7.8	<2	Low	0.10	5	1	<.5
Cotopaxi	7-60	2-6	6.0-20	0.04-0.06	7.4-7.8	<2	Low	0.10			
17	0-30	20-27	0.6-2.0	0.14-0.17	7.9-8.4	>16	Low	0.20	4	5	.5-1
Crestvale	30-42	18-35	0.2-0.6	0.13-0.15	7.9-8.4	2-8	Moderate	0.24			
	42-60	15-25	0.6-2.0	0.10-0.12	7.9-8.4	2-4	Low	0.15			
18*:											
Cryaquolls.											
Histosols.											
19	0-6	15-25	0.6-2.0	0.16-0.18	6.6-7.8	<2	Moderate	0.28	5	6	2-3
Decross	6-30	18-35	0.6-2.0	0.19-0.21	6.6-7.8	<2	Moderate	0.37			
	30-60	15-35	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	0.43			
20	0-4	15-25	0.6-2.0	0.11-0.13	6.6-7.8	<2	Low	0.20	2	5	.5-1
Derrick	4-13	18-30	0.6-2.0	0.11-0.14	6.6-8.4	<2	Low	0.17			
	13-60	0-5	>20.0	0.04-0.06	7.4-9.0	<2	Low	0.10			
21	0-6	30-40	0.2-2.0	0.09-0.18	6.6-7.8	<2	Moderate	0.15	5	8	2-3
Des Moines	6-12	35-40	0.2-0.6	0.09-0.18	6.6-7.8	<2	Moderate	0.17			
	12-25	25-35	0.2-0.6	0.08-0.14	6.6-7.8	<2	Moderate	0.10			
	25-60	25-35	0.2-0.6	0.08-0.14	6.6-7.8	<2	Moderate	0.05			
22*.											
Duneland											
23	0-6	8-20	6.0-20	0.07-0.09	7.9-8.4	<2	Low	0.15	1	8	.5-1
Dunul	6-60	0-3	>20	0.04-0.06	7.9-8.4	<4	Low	0.10			
24, 25	0-9	15-25	0.6-2.0	0.05-0.10	7.4-8.4	<2	Low	0.15	5	8	.5-1
Garita	9-60	10-20	0.6-2.0	0.05-0.08	7.4-8.4	<2	Low	0.10			
26*:											
Garita	0-12	15-25	0.6-2.0	0.05-0.10	7.4-8.4	<2	Low	0.15	5	8	.5-1
	12-60	10-20	0.6-2.0	0.05-0.08	7.4-8.4	<2	Low	0.10			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
26*:											
Platoro	0-8	15-27	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low	0.24	3	4L	.5-1
	8-21	27-35	0.2-0.6	0.14-0.18	7.4-8.4	<2	Low	0.20			
	21-33	18-27	0.6-2.0	0.11-0.14	7.4-8.4	<2	Low	0.10			
	33-60	0-5	6.0-20	0.05-0.08	7.4-8.4	<2	Low	0.05			
27	0-4	15-20	2.0-6.0	0.10-0.13	6.6-7.8	<2	Low	0.15	5	3	2-3
Gelkie	4-13	20-35	0.6-2.0	0.14-0.16	6.6-7.8	<2	Moderate	0.20			
	13-24	20-35	0.6-2.0	0.10-0.13	6.6-8.4	<2	Moderate	0.20			
	24-60	15-25	0.6-2.0	0.10-0.13	7.9-8.4	<2	Low	0.10			
28	0-4	15-25	0.6-2.0	0.16-0.18	6.1-7.8	<2	Low	0.28	2	6	2-4
Gerrard	4-12	20-35	0.6-2.0	0.15-0.18	6.1-7.8	<2	Moderate	0.24			
	12-60	2-5	6.0-20	0.05-0.07	6.6-7.3	<2	Low	0.10			
29	0-4	8-20	2.0-6.0	0.09-0.11	6.6-8.4	<2	Low	0.15	2	6	.5-1
Graypoint	4-13	20-35	0.6-2.0	0.14-0.16	7.4-8.4	<2	Moderate	0.24			
	13-60	0-3	>20	0.03-0.05	7.4-8.4	<2	Low	0.10			
30	0-5	0-7	6.0-20	0.06-0.08	7.9-8.4	<2	Low	0.10	5	2	1-2
Gunbarrel	5-60	0-7	6.0-20	0.04-0.08	7.9-9.0	<4	Low	0.10			
31	0-5	0-7	6.0-20	0.06-0.08	7.9-9.0	4-16	Low	0.10	5	2	---
Gunbarrel	5-60	0-7	6.0-20	0.04-0.08	7.9-9.0	<8	Low	0.10			
32	0-7	15-27	0.6-2.0	0.12-0.16	7.9-9.0	4-16	Low	0.24	5	4	1-2
Hagga	7-60	18-35	0.2-0.6	0.12-0.18	7.9-9.0	4-16	Moderate	0.24			
33	0-2	30-40	0.06-0.2	0.07-0.09	8.5-9.0	4-8	High	0.32	5	4L	1-3
Hapney	2-20	35-55	0.06-0.2	0.08-0.10	8.5-9.0	4-8	High	0.32			
	20-34	40-55	0.06-0.2	0.10-0.13	7.9-9.0	2-4	High	0.24			
	34-60	20-35	0.2-0.6	0.14-0.16	7.9-9.0	2-4	Moderate	0.15			
34*:											
Harlem	0-9	40-55	0.06-0.2	0.11-0.15	7.4-8.4	4-8	High	0.32	5	4	1-3
	9-52	35-55	0.06-0.2	0.08-0.12	7.4-9.0	8-16	High	0.37			
	52-60	15-35	0.06-0.2	0.08-0.11	>7.8	8-16	Moderate	0.43			
Slickspots.											
35	0-4	0-5	2.0-6.0	0.06-0.08	>9.0	<4	Low	0.17	3	2	.5-1
Hooper	4-30	35-55	<0.06	0.04-0.06	>9.0	4-8	High	0.37			
	30-60	0-5	6.0-20	0.03-0.05	>9.0	<4	Low	0.05			
36	0-4	27-40	<0.06	0.04-0.06	>9.0	4-8	Moderate	0.28	3	4	.5-1
Hooper	4-30	35-55	<0.06	0.04-0.06	>9.0	4-8	High	0.37			
	30-60	0-5	6.0-20	0.03-0.05	>9.0	<4	Low	0.05			
37*:											
Hopkins	0-15	18-27	0.6-2.0	0.10-0.13	6.6-8.4	<2	Low	0.17	1	8	2-4
	15-60	0	>20	0.01-0.02	6.6-8.4	<2	Low	0.02			
Cheadle	0-9	10-27	0.6-2.0	0.14-0.18	6.6-7.8	<2	Low	0.20	1	5	2-4
	9-15	10-27	0.6-2.0	0.07-0.11	7.4-8.4	2-4	Low	0.10			
	15	---	---	---	---	---	---	---			
Rock outcrop.											
38*.											
Humic Cryaquepts											
39	0-6	18-27	0.6-2.0	0.16-0.18	6.1-7.3	<2	Low	0.28	5	5	2-5
Jodero	6-60	18-25	0.6-2.0	0.13-0.15	7.4-8.4	<2	Low	0.24			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
40*:											
Jodero	0-6	10-25	0.6-2.0	0.16-0.18	6.1-7.3	<2	Low	0.24	5	5	2-4
	6-60	20-35	0.6-2.0	0.17-0.20	6.1-7.3	<2	Moderate	0.28			
Lolo	0-8	15-20	2.0-6.0	0.12-0.16	6.6-7.8	<4	Low	0.28	5	7	2-4
	8-25	15-25	2.0-6.0	0.10-0.14	6.6-7.8	<2	Low	0.24			
	25-37	15-25	2.0-6.0	0.05-0.08	6.6-7.8	<2	Low	0.20			
	37-60	10-25	2.0-6.0	0.04-0.07	6.6-8.4	<2	Low	0.20			
41	0-8	3-6	2.0-6.0	0.06-0.10	7.4-9.0	8-16	Low	0.10	5	1	.5-1
Kerber	8-27	8-18	0.6-2.0	0.10-0.13	7.9-9.0	4-16	Low	0.15			
	27-60	0-3	>20	0.05-0.08	6.6-8.4	4-8	Low	0.10			
42	0-8	15-25	0.6-2.0	0.09-0.16	>7.8	>4	Low	0.32	5	4L	<.5
Laney	8-50	18-35	0.06-0.6	0.09-0.16	>8.4	>4	Moderate	0.43			
43, 44	0-7	15-27	0.6-2.0	0.16-0.20	7.9-8.4	2-4	Low	0.28	5	4L	.5-1
Luhon	7-60	18-35	0.6-2.0	0.11-0.13	7.9-9.0	4-8	Low	0.24			
45	0-17	12-20	2.0-6.0	0.11-0.13	7.4-8.4	2-8	Low	0.17	5	3	.5-1
McGinty	17-60	10-18	2.0-6.0	0.10-0.12	7.9-8.4	2-8	Low	0.17			
46	0-19	10-20	2.0-6.0	0.15-0.18	7.4-8.4	<2	Low	0.24	5	3	3-6
Medano	19-60	2-5	6.0-20	0.06-0.08	7.4-8.4	<2	Low	0.10			
47*:											
Medano	0-19	10-20	2.0-6.0	0.15-0.18	7.4-8.4	<2	Low	0.24	5	3	3-6
	19-60	2-5	6.0-20	0.06-0.08	7.4-8.4	<2	Low	0.10			
Hapney	0-2	30-40	0.06-0.2	0.07-0.09	8.5-9.0	4-8	High	0.32	5	4L	1-3
	2-20	35-55	0.06-0.2	0.08-0.10	8.5-9.0	4-8	High	0.32			
	20-34	40-55	0.06-0.2	0.10-0.13	7.9-9.0	2-4	High	0.24			
	34-60	20-35	0.2-0.6	0.14-0.16	7.9-9.0	2-4	Moderate	0.15			
48	0-12	15-25	0.6-2.0	0.16-0.18	6.6-8.4	<2	Low	0.24	5	5	.5-1
Monte	12-60	18-27	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	0.24			
49	0-5	28-35	0.2-2.0	0.18-0.21	7.4-8.4	<4	Moderate	0.32	5	6	1-2
Morval	5-27	25-35	0.6-2.0	0.14-0.21	7.4-8.4	<4	Moderate	0.24			
	27-60	28-35	0.6-2.0	0.08-0.16	7.9-8.4	<4	Moderate	0.15			
50	0-8	4-7	2.0-6.0	0.06-0.10	7.4-9.0	<4	Low	0.10	5	2	.5-1
Mosca	8-32	8-18	0.6-2.0	0.10-0.13	7.9-9.0	<8	Low	0.15			
	32-60	0-3	>20	0.05-0.08	6.6-8.4	<4	Low	0.10			
51*:											
Mount Home	0-16	12-20	2.0-6.0	0.06-0.07	7.4-8.4	<2	Low	0.15	5	8	.5-1
	16-60	8-18	2.0-6.0	0.08-0.10	7.9-8.4	<2	Low	0.17			
Saguache	0-8	5-18	2.0-6.0	0.11-0.18	7.9-9.0	<2	Low	0.15	1	3	.4-.7
	8-60	0-5	>6.0	0.03-0.05	7.4-9.0	<2	Low	0.05			
52	0-8	10-20	6.0-20	0.07-0.10	7.4-8.4	2-8	Low	0.15	3	3	.5-1
Norte	8-26	8-18	6.0-20	0.07-0.09	7.4-8.4	2-8	Low	0.15			
	26-50	2-8	>20	0.04-0.07	7.4-8.4	<4	Low	0.10			
53*:											
Ouray	0-13	0-5	6.0-20.0	0.05-0.08	7.4-8.4	<2	Low	0.10	5	2	1-2
	13-60	0-5	>6.0	0.04-0.08	6.6-8.4	2-4	Low	0.10			
Sabe	0-7	5-15	2.0-6.0	0.07-0.11	6.6-7.8	<2	Low	0.20	5	8	2-3
	7-48	10-22	2.0-6.0	0.09-0.13	6.6-7.8	<2	Low	0.17			
	48-60	0-10	6.0-20	0.03-0.06	6.6-7.8	<2	Low	0.10			
54	0-8	15-25	0.6-2.0	0.08-0.11	6.6-7.3	<2	Low	0.24	3	8	2-4
Parlin	8-20	35-40	0.06-0.2	0.11-0.16	6.6-7.8	<2	Moderate	0.17			
	20-60	12-35	0.6-2.0	0.05-0.07	7.9-8.4	<2	Low	0.15			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
55---------- Platoro	0-8	15-27	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low--------	0.24	3	4L	.5-1
	8-21	27-35	0.2-0.6	0.14-0.18	7.4-8.4	<2	Moderate--	0.20			
	21-33	18-27	0.6-2.0	0.11-0.14	7.4-8.4	<2	Low--------	0.10			
	33-60	0-5	6.0-20	0.05-0.08	7.4-8.4	<2	Low--------	0.05			
56---------- Platoro	0-8	20-27	0.6-2.0	0.14-0.16	7.4-8.4	<2	Low--------	0.24	3	8	.5-1
	8-39	20-34	0.2-0.6	0.16-0.18	7.4-8.4	<2	Moderate	0.15			
	39-60	0-8	6.0-20	0.03-0.05	7.4-8.4	<2	Low--------	0.10			
57*. Rock outcrop											
58, 59---------- Rock River	0-6	18-25	0.6-2.0	0.13-0.18	6.6-7.8	<2	Low--------	0.28	5	5	.5-2
	6-30	20-30	0.6-2.0	0.14-0.16	6.6-7.8	<2	Low--------	0.28			
	30-60	15-25	0.6-6.0	0.08-0.13	7.9-9.0	2-4	Low--------	0.24			
60, 61---------- Saguache	0-8	5-18	2.0-6.0	0.11-0.18	7.9-9.0	<2	Low--------	0.15	1	3	.4-.7
	8-60	0-5	>6.0	0.03-0.05	7.4-9.0	<2	Low--------	0.05			
62---------- San Arcacio	0-5	10-20	2.0-6.0	0.11-0.13	7.9-9.0	<8	Low--------	0.24	3	3	.5-1
	5-25	18-35	0.6-2.0	0.14-0.16	7.4-9.0	<2	Moderate	0.28			
	25-60	0-3	>6.0	0.04-0.06	7.4-8.4	<4	Low--------	0.10			
63, 64---------- San Luis	0-10	10-20	2.0-6.0	0.10-0.13	7.9-9.0	>4	Low--------	0.15	3	3	.5-1
	10-37	18-35	0.2-0.6	0.13-0.18	>8.4	>4	Moderate	0.24			
	37-60	0-5	6.0-20	0.04-0.06	7.4-9.0	2-8	Low--------	0.10			
65---------- Schrader	0-8	5-10	2.0-6.0	0.11-0.13	6.6-7.8	<4	Low--------	0.15	5	3	2-5
	8-60	5-18	2.0-6.0	0.14-0.17	6.6-7.8	<4	Low--------	0.17			
66---------- Seitz	0-4	15-27	0.6-2.0	0.08-0.10	6.6-7.3	<2	Low--------	0.17	5	8	.5-1
	4-28	35-55	0.06-0.2	0.10-0.12	6.6-7.3	<2	Moderate	0.17			
	28-60	30-40	0.2-0.6	0.12-0.14	6.6-7.3	<2	Moderate	0.15			
67---------- Seitz	0-12	15-27	0.6-2.0	0.08-0.10	6.6-7.3	<2	Low--------	0.17	5	8	.5-1
	12-28	35-45	0.06-0.2	0.10-0.12	6.6-7.3	<2	Moderate	0.17			
	28-60	30-40	0.2-0.6	0.12-0.14	6.6-7.3	<2	Moderate	0.10			
68---------- Sessions	0-14	22-27	0.6-2.0	0.16-0.18	6.6-7.8	<2	Moderate	0.32	5	6	2-5
	14-51	35-55	0.06-0.6	0.16-0.21	6.6-7.8	<2	High------	0.24			
	51-60	35-50	0.06-0.6	0.16-0.21	6.6-8.4	<2	High------	0.28			
69---------- Shawa	0-13	20-27	0.6-2.0	0.16-0.18	6.6-8.4	2-4	Low--------	0.24	5	8	3-6
	13-53	28-35	0.6-2.0	0.16-0.18	6.6-8.4	2-4	Moderate	0.32			
	53-60	20-35	0.6-2.0	0.15-0.18	6.6-8.4	2-4	Low--------	0.32			
70, 71---------- Space City	0-8	4-8	6.0-20	0.07-0.10	7.9-8.4	<2	Low--------	0.15	5	2	<.5
	8-60	2-7	>6.0	0.04-0.08	>7.8	<2	Low--------	0.10			
72*: Space City------	0-8	4-8	6.0-20	0.07-0.10	7.9-8.4	<2	Low--------	0.15	5	2	<.5
	8-60	2-7	>6.0	0.04-0.08	>7.8	<2	Low--------	0.10			
Hooper----------	0-4	0-5	2.0-6.0	0.06-0.08	>9.0	<4	Low--------	0.17	3	2	.5-1
	4-30	35-55	<0.06	0.04-0.06	>9.0	4-8	High------	0.37			
	30-60	0-5	6.0-20	0.03-0.05	>9.0	<4	Low--------	0.05			
73*: Tolman----------	0-4	18-27	0.6-2.0	0.12-0.14	6.1-7.8	<2	Low--------	0.32	1	8	.5-2
	4-10	28-35	0.6-2.0	0.14-0.18	6.1-7.8	<2	Low--------	0.37			
	10-13	18-35	0.6-2.0	0.10-0.14	6.6-7.8	<2	Low--------	0.32			
	13	---	---	---	---	---	----------	----			
Rock outcrop.											
74---------- Torsido	0-8	15-25	0.6-2.0	0.16-0.18	6.6-8.4	<2	Low--------	0.24	2	6	2-5
	8-23	28-35	0.6-2.0	0.17-0.19	6.6-8.4	<2	Moderate	0.24			
	23-60	0-5	>20	0.03-0.05	6.6-7.3	<2	Low--------	0.10			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
75*:											
Torsido	0-8	15-25	0.6-2.0	0.16-0.18	6.6-8.4	<2	Low	0.24	2	6	2-5
	8-23	28-35	0.6-2.0	0.17-0.19	6.6-8.4	<2	Moderate	0.24			
	23-60	0-5	>20	0.03-0.05	6.6-7.3	<2	Low	0.10			
Gerrard	0-4	15-25	0.6-2.0	0.16-0.18	6.1-7.8	<2	Low	0.28	2	6	2-4
	4-12	20-35	0.6-2.0	0.15-0.18	6.1-7.8	<2	Moderate	0.24			
	12-60	2-5	6.0-20	0.05-0.07	6.6-7.3	<2	Low	0.10			
76	0-4	15-27	0.6-2.0	0.06-0.08	7.9-8.4	<2	Low	0.10	1	8	.5-1
Travelers	4-13	15-27	0.6-2.0	0.06-0.08	7.9-9.4	<2	Low	0.10			
	13	---	---	---	---	---	---	---			
77*:											
Travelers	0-4	15-27	0.6-2.0	0.06-0.08	7.9-8.4	<2	Low	0.10	1	8	.5-1
	4-13	15-27	0.6-2.0	0.06-0.08	7.9-9.4	<2	Low	0.10			
	13	---	---	---	---	---	---	---			
Garita	0-9	15-25	0.6-2.0	0.05-0.10	7.4-8.4	<2	Low	0.15	5	8	.5-1
	9-60	10-20	0.6-2.0	0.05-0.08	7.4-8.4	<2	Low	0.10			
78	0-4	10-20	0.6-2.0	0.07-0.09	6.6-7.8	<2	Low	0.10	2	8	1-2
Uracca	4-36	18-35	2.0-6.0	0.06-0.08	6.6-8.4	<2	Low	0.17			
	36-60	0-10	>20	0.03-0.05	7.9-8.4	<2	Low	0.10			
79	0-8	20-27	0.6-2.0	0.16-0.21	7.4-8.4	<4	Moderate	0.28	3	5	2-5
Vastine	8-22	20-30	0.6-2.0	0.16-0.21	7.4-8.4	<4	Moderate	0.28			
	22-60	1-5	6.0-20	0.04-0.08	7.4-8.4	<4	Low	0.10			
80	0-24	18-27	0.6-2.0	0.10-0.16	8.5-9.0	4-8	Moderate	0.28	3	5	2-5
Vastine	24-60	0-10	6.0-20	0.04-0.08	7.9-9.0	4-8	Low	0.10			
81	0-8	20-25	0.2-0.6	0.16-0.18	7.4-8.4	2-8	Moderate	0.24	5	5	2-4
Villa Grove	8-32	20-35	0.2-0.6	0.10-0.14	7.4-8.4	<8	Moderate	0.20			
	32-60	15-25	0.6-2.0	0.14-0.16	7.9-8.4	<8	Low	0.28			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
1---------- Acasco	D	Rare--------	---	---	1.5-2.0	Apparent	May-Jul	>60	---	Moderate	High-----	Low.
2, 3---------- Alamosa	D	Frequent----	Brief-----	May-Jun	1.0-1.5	Apparent	May-Oct	>60	---	High-----	High-----	Moderate.
4---------- Arena	D	Occasional	Brief-----	Mar-Jun	1.0-2.0	Apparent	Apr-Aug	---	---	High-----	High-----	High.
5---------- Biedell	D	Frequent----	Brief-----	May-Sep	2.0-3.0	Apparent	May-Sep	>60	---	High-----	High-----	Moderate.
6---------- Big Blue	D	Frequent----	Brief-----	May-Jun	0.5-1.0	Apparent	May-Aug	>60	---	High-----	High-----	Low.
7*:												
Big Blue---------	D	Frequent----	Brief-----	May-Jun	0.5-1.0	Apparent	May-Aug	>60	---	High-----	High-----	Low.
Gerrard----------	C	Rare--------	---	---	1.0-1.5	Apparent	Apr-Aug	>60	---	Moderate	High-----	Low.
8*:												
Big Blue---------	D	Frequent----	Brief-----	May-Jun	0.5-1.0	Apparent	May-Aug	>60	---	High-----	High-----	Low.
Hagga----------	D	Rare--------	---	---	0.5-1.0	Apparent	Apr-Aug	>60	---	High-----	High-----	High.
9---------- Bushvalley	D	None--------	---	---	>6.0	---	---	7-20	Hard	Moderate	Moderate	Moderate.
10*:												
Bushvalley-------	D	None--------	---	---	>6.0	---	---	7-20	Hard	Moderate	Moderate	Moderate.
Gelkie----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Rock outcrop.												
11*:												
Bushvalley-------	D	None--------	---	---	>6.0	---	---	7-20	Hard	Moderate	Moderate	Moderate.
Tellura----------	C	None--------	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate	Low.
12---------- Comodore	D	None--------	---	---	>6.0	---	---	10-20	Hard	Low------	Moderate	Moderate.
13*:												
Comodore---------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Low------	Moderate	Moderate.
Rock outcrop.												
14*:												
Corlett----------	A	None--------	---	---	3.5-6.0	Perched	Jun-Aug	>60	---	Low------	High-----	Moderate.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
14*: Hooper	D	None	---	---	4.0-6.0	Apparent	Jun-Sep	>60	---	Low	High	Low.
15--- Costilla	A	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
16--- Cotopaxi	A	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
17--- Crestvale	C	None	---	---	2.5-3.5	Apparent	May-Sep	>60	---	Low	High	High.
18*: Cryaquolls. Histosols.												
19--- Decross	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
20--- Derrick	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
21--- Des Moines	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
22*. Duneland												
23--- Dunul	A	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
24, 25--- Garita	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
26*: Garita	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
Platoro	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
27--- Gelkie	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
28--- Gerrard	C	Rare	---	---	1.0-1.5	Apparent	Apr-Aug	>60	---	Moderate	High	Low.
29--- Graypoint	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
30--- Gunbarrel	A	None	---	---	4.5-5.0	Apparent	May-Aug	>60	---	Moderate	High	Low.
31--- Gunbarrel	C	None	---	---	1.5-2.0	Apparent	Apr-Aug	>60	---	Moderate	High	Low.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
32---------- Hagga	D	Rare--------	---	---	0.5-1.0	Apparent	Apr-Aug	>60	---	High-----	High-----	High.
33---------- Hapney	C	None--------	---	---	4.0-5.0	Apparent	Jun-Sep	>60	---	Moderate	High-----	Low.
34*: Harlem----------	B/D	Rare--------	---	---	3.5-5.0	Apparent	Apr-Sep	>60	---	Moderate	High-----	Moderate.
Slickspots.												
35, 36---------- Hooper	D	None--------	---	---	4.0-6.0	Apparent	Jun-Sep	>60	---	Low------	High-----	Low.
37*: Hopkins----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Cheadle----------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	High-----	Low.
Rock outcrop-----	D	None--------	---	---	>6.0	---	---	0	Hard	---	---	---
38*. Humic Cryaquepts												
39---------- Jodero	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
40*: Jodero----------	B	Rare--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Lolo----------	B	Occasional	Brief-----	Apr-Jun	1.5-2.5	Apparent	Apr-Aug	>60	---	Moderate	High-----	Low.
41---------- Kerber	B	None--------	---	---	2.0-3.0	Apparent	Apr-Aug	>60	---	High-----	High-----	High.
42---------- Laney	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
43, 44---------- Luhon	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
45---------- McGinty	B	None--------	---	---	4.5-5.0	Apparent	Apr-Jun	>60	---	Moderate	High-----	Low.
46---------- Medano	C	Rare--------	---	---	1.5-3.0	Apparent	Apr-Jun	>60	---	High-----	High-----	Low.
47*: Medano----------	C	Rare--------	---	---	1.5-3.0	Apparent	Apr-Jun	>60	---	High-----	High-----	Low.
Hapney----------	C	None--------	---	---	4.0-5.0	Apparent	Jun-Sep	>60	---	Moderate	High-----	Low.
48---------- Monte	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
49--- Morval	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
50--- Mosca	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
51*:												
Mount Home	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
Saguache	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
52--- Norte	C	None	---	---	2.5-4.0	Apparent	May-Sep	>60	---	Moderate	High	Low.
53*:												
Ouray	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
Sabe	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
54--- Parlin	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
55, 56--- Platoro	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
57*. Rock outcrop												
58, 59--- Rock River	B	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
60, 61--- Saguache	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
62--- San Arcacio	B	None	---	---	3.0-4.0	Apparent	May-Jul	>60	---	Low	High	Low.
63--- San Luis	C	None	---	---	0-2.0	Apparent	May-Aug	>60	---	High	High	Low.
64--- San Luis	C	None	---	---	2.0-3.5	Apparent	May-Aug	>60	---	High	High	Low.
65--- Schrader	C	Frequent	Brief	Apr-Jul	1.0-2.0	Apparent	Apr-Aug	>60	---	High	High	Low.
66, 67--- Seitz	C	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
68--- Sessions	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
69--- Shawa	B	None	---	---	4.0-6.0	Apparent	Apr-Aug	>60	---	High	High	Low.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
70, 71--- Space City	A	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
72*:												
Space City	A	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
Hooper	D	None	---	---	4.0-6.0	Apparent	Jun-Sep	>60	---	Low	High	Low.
73*:												
Tolman	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate	Low.
Rock outcrop.												
74--- Torsido	C	None	---	---	1.0-2.0	Apparent	Jun-Aug	>60	---	High	High	Low.
75*:												
Torsido	C	None	---	---	1.0-2.0	Apparent	Jun-Aug	>60	---	High	High	Low.
Gerrard	C	Rare	---	---	1.0-1.5	Apparent	Apr-Aug	>60	---	Moderate	High	Low.
76--- Travelers	D	None	---	---	>6.0	---	---	12-20	Hard	Low	High	Low.
77*:												
Travelers	D	None	---	---	>6.0	---	---	12-20	Hard	Low	High	Low.
Garita	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
78--- Uracca	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
79--- Vastine	C	Frequent	Long	May-Jul	2.0-3.5	Apparent	May-Aug	>60	---	High	High	Moderate.
80--- Vastine	C	Occasional	Brief	May-Jun	1.0-2.5	Apparent	Apr-Sep	>60	---	High	High	Low.
81--- Villa Grove	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Acasco	Clayey over sandy or sandy-skeletal, montmorillonitic, frigid Typic Haplaquolls
Alamosa	Fine-loamy, mixed, frigid Typic Argiaquolls
Arena	Fine-loamy, mixed, frigid Aquentic Durorthids
Biedell	Clayey over sandy or sandy-skeletal, montmorillonitic, frigid Aquic Natrargids
Big Blue	Fine, montmorillonitic (calcareous), frigid Typic Haplaquolls
Bushvalley	Loamy-skeletal, mixed Argic Lithic Cryoborolls
Cheadle	Loamy-skeletal, mixed Lithic Cryoborolls
Comodore	Loamy-skeletal, mixed Lithic Haploborolls
Corlett	Mixed, frigid Typic Torripsamments
Costilla	Mixed, frigid Typic Torripsamments
Cotopaxi	Mixed, frigid Typic Torripsamments
Crestvale	Fine-loamy, mixed, frigid Cambic Gypsiorthids
Cryaquolls	Cryaquolls
Decross	Fine-loamy, mixed Argic Pachic Cryoborolls
Derrick	Loamy-skeletal, mixed, frigid Typic Haplargids
Des Moines*	Clayey-skeletal, montmorillonitic Pachic Argiborolls
Duneland.	
Dunul	Sandy-skeletal, mixed, frigid Typic Torriorthents
Garita	Loamy-skeletal, mixed, frigid Typic Calciorthids
Gelkie	Fine-loamy, mixed Argic Cryoborolls
Gerrard	Fine-loamy over sandy or sandy-skeletal, mixed, frigid Typic Haplaquolls
Graypoint	Fine-loamy over sandy or sandy-skeletal, mixed, frigid Typic Haplargids
Gunbarrel	Mixed, frigid Typic Psammaquents
Hagga*	Fine-loamy, mixed (calcareous), frigid Typic Fluvaquents
Hapney	Fine, montmorillonitic Aridic Natriborolls
Harlem*	Fine, montmorillonitic (calcareous), frigid Ustic Torrifluvents
Histosols	Histosols
Hooper	Clayey over sandy or sandy-skeletal, montmorillonitic, frigid Typic Natrargids
Hopkins	Fine-loamy over fragmental, mixed Typic Cryoborolls
Humic Cryaquepts	Humic Cryaquepts
Jodero	Fine-loamy, mixed Cumulic Haploborolls
Kerber	Coarse-loamy, mixed, frigid Aquic Natrargids
Laney	Fine-loamy, mixed (calcareous), frigid Typic Torrifluvents
Lolo*	Loamy-skeletal, mixed Pachic Haploborolls
Luhon	Fine-loamy, mixed Borollic Calciorthids
McGinty	Coarse-loamy, mixed, frigid Typic Calciorthids
Medano	Sandy, mixed, frigid Typic Haplaquolls
Monte	Fine-loamy, mixed (calcareous), frigid Typic Torriorthents
Morval*	Fine-loamy, mixed Aridic Argiborolls
Mosca	Coarse-loamy, mixed, frigid Typic Natrargids
Mount Home	Loamy-skeletal, mixed (calcareous), frigid Typic Torriorthents
Norte	Loamy-skeletal, mixed (calcareous), frigid Aquic Ustorthents
Ouray	Sandy, mixed Torriorthentic Haploborolls
Parlin	Clayey over loamy-skeletal, montmorillonitic Argic Cryoborolls
Platoro	Fine-loamy over sandy or sandy-skeletal, mixed Argic Cryoborolls
Rock outcrop.	
Rock River	Fine-loamy, mixed Borollic Haplargids
Sabe*	Sandy-skeletal, mixed Psammentic Eutroboralfs
Saguache	Sandy-skeletal, mixed, frigid Typic Torriorthents
San Arcacio	Fine-loamy over sandy or sandy-skeletal, mixed, frigid Typic Haplargids
San Luis	Fine-loamy over sandy or sandy-skeletal, mixed, frigid Aquic Natrargids
Schrader	Coarse-loamy, mixed, frigid Cumulic Haplaquolls
Seitz*	Clayey-skeletal, montmorillonitic Typic Cryoboralfs
Sessions	Fine, montmorillonitic Argic Cryoborolls
Shawa	Fine-loamy, mixed Pachic Haploborolls
Slickspots.	
Space City	Mixed, frigid Typic Torripsamments
Tellura	Clayey-skeletal, montmorillonitic Argic Cryoborolls
Tolman*	Loamy-skeletal, mixed Lithic Argiborolls
Torsido	Fine-loamy over sandy or sandy-skeletal, mixed, frigid Typic Argiaquolls
Travelers	Loamy-skeletal, mixed Borollic Lithic Camborthids
Uracca	Loamy-skeletal, mixed Aridic Argiborolls
Vastine	Fine-loamy over sandy or sandy-skeletal, mixed, frigid Typic Haplaquolls
Villa Grove	Fine-loamy, mixed Aridic Argiborolls

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

*U.S. GPO: 1984-404-575/10028

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SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

CHAFFEE COUNTY

R 9 E

R 10 E

R 11 E

R 12 E

R 73 W

R 8 E

R 7 E

R 6 E

R 5 E

R 4 E

T 48 N

T 47 N

T 46 N

T 45 N

T 44 N

T 43 N

T 42 N

T 41 N

T 25 S

T 26 S

38°20′

38°10′

38°00′

37°50′

106°20′

106°30′

106°10′

106°00′

105°50′

105°40′

N

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

LEGEND

NEARLY LEVEL AND GENTLY SLOPING SOILS THAT ARE POORLY DRAINED AND SUBJECT TO FLOODING

1 Big Blue-Gerrard: Deep, nearly level and gently sloping, poorly drained loamy soils, on flood plains, low terraces, and fans

NEARLY LEVEL AND GENTLY SLOPING SOILS THAT ARE POORLY DRAINED TO WELL DRAINED AND AFFECTED BY SALT AND ALKALI

2 Hooper-Hagga-Hapney: Deep, nearly level, poorly drained and moderately well drained loamy soils; on flood plains, terraces, and fans

3 San Luis-Laney: Deep, nearly level and gently sloping, somewhat poorly drained to well drained loamy soils, on fans and flood plains

4 Gunbarrel-Mosca-Kerber: Deep, nearly level, poorly drained to well drained sandy soils, on flood plains, terraces, and fans

NEARLY LEVEL TO STEEP SOILS THAT ARE MODERATELY WELL DRAINED TO EXCESSIVELY DRAINED

5 Saguache-San Arcacio-Dunul: Deep, nearly level and gently sloping, well drained gravelly and loamy soils; on flood plains, fans, and terraces

6 Norte-Dunul-Graypoint: Deep, nearly level and gently sloping, moderately well drained to somewhat excessively drained gravelly and loamy soils, on terraces and fans

7 Garita-Platoro-Luhon: Deep, nearly level to moderately sloping, well drained gravelly and loamy soils, on fans, foot slopes, and valley side slopes

8 Space-City-Cotopaxi: Deep, nearly level to moderately sloping, somewhat excessively drained sandy soils, on valley floors

9 Dune land: Deep, gently rolling to steep, excessively drained sandy soils, on dunes

GENTLY SLOPING TO VERY STEEP, WELL DRAINED SOILS, AND ROCK OUTCROP

10 Travelers-Garita-Rock outcrop: Deep and shallow, gently sloping to steep, well drained and somewhat excessively drained, stony and gravelly loamy soils, and Rock outcrop; on hills, ridges, mesas, fans, and foot slopes

11 Comodore-Uracca-Rock outcrop: Deep and shallow, strongly sloping to very steep, well drained, very stony and very cobbly loamy soils, and Rock outcrop; on mountainsides and fans

12 Seitz-Bushvalley-Rock outcrop: Deep and shallow, rolling to very steep, well drained, very stony and cobbly loamy soils, and Rock outcrop, on mountainsides and ridges

13 Hopkins-Cheadle-Parlin: Deep and shallow, gently sloping to steep, well drained, channery and gravelly loamy soils; on ridges and mountainsides

14 Bushvalley-Gelkie-Tellura: Deep and shallow, gently sloping to very steep, well drained cobbly and loamy soils, on ridges and mountainsides

Compiled 1984

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
SAGUACHE COUNTY

GENERAL SOIL MAP

SAGUACHE COUNTY AREA
COLORADO

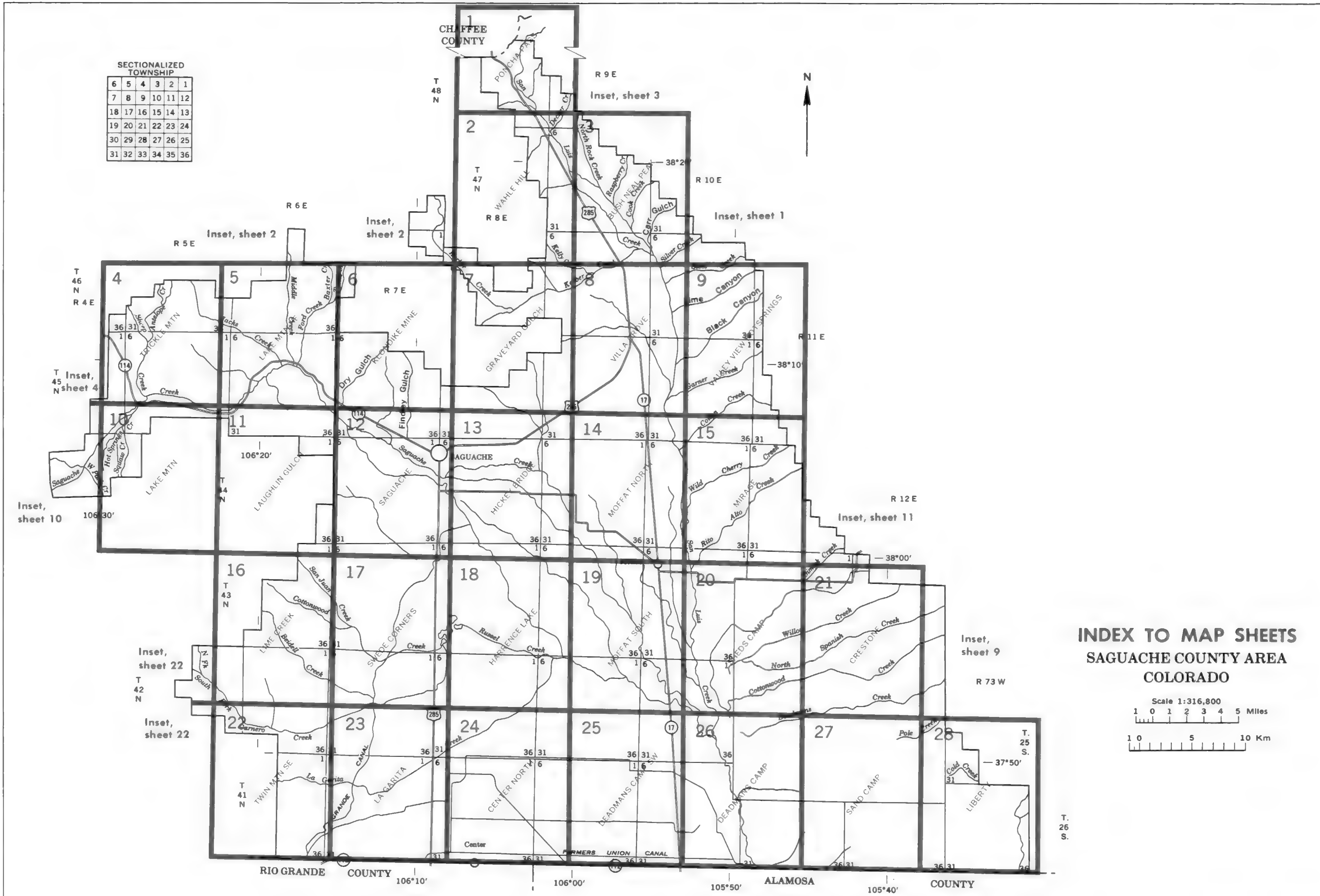
Scale 1:316,800

1 0 1 2 3 4 5 Miles

1 0 5 10 Km

RIO GRANDE COUNTY

ALAMOSA COUNTY



INDEX TO MAP SHEETS
SAGUACHE COUNTY AREA
COLORADO
Scale 1:316,800
1 0 1 2 3 4 5 Miles
1 0 5 10 Km
SECTIONALIZED TOWNSHIP
N
CHAFFEE COUNTY
RIO GRANDE COUNTY
ALAMOSA COUNTY
Inset, sheet 1
Inset, sheet 2
Inset, sheet 3
Inset, sheet 4
Inset, sheet 9
Inset, sheet 10
Inset, sheet 11
Inset, sheet 22
SAGUACHE
Center
R 4 E
R 5 E
R 6 E
R 7 E
R 8 E
R 9 E
R 10 E
R 11 E
R 12 E
R 73 W
T 48 N
T 47 N
T 46 N
T 45 N
T 44 N
T 43 N
T 42 N
T 41 N
T. 25 S.
T. 26 S.
38°20'
38°10'
38°00'
37°50'
106°30'
106°20'
106°10'
106°00'
105°50'
105°40'
WAHLE HILL
BUSH NEAL PEAK
VILLA GROVE
VALLEY VIEW HOT SPRINGS
GRAVEYARD GULCH
KLONDIKE MINE
LAKE MTN
TRICKLE MTN
LAUGHLIN GULCH
SAGUACHE
HICKEY BRIDGE
MOFFAT NORTH
MIRAGE
LIME CREEK
SWEDE CORNERS
HARRENCE LAKE
MOFFAT SOUTH
REEDS CAMP
CRESTONE
TWIN MTN SE
LA GARITA
CENTER NORTH
DEADMANS CAMP SW
DEADMANS CAMP
SAND CAMP
LIBERTY
FARMERS UNION CANAL

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SAGUACHE COUNTY AREA, COLORADO

U. S. DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
SAGUACHE COUNTY

SOIL LEGEND

SYMBOL	NAME
1	Acasco clay loam
2	Alamosa clay loam
3	Alamosa clay loam, saline
4	Arena loam
5	Biedell clay loam
6	Big Blue clay loam, 0 to 3 percent slopes
7	Big Blue-Gerrard complex, 0 to 3 percent slopes
8	Big Blue-Hegga, dry complex
9	Bushvalley cobbly loam, 3 to 45 percent slopes
10	Bushvalley-Gelkie-Rock outcrop complex, 3 to 65 percent slopes
11	Bushvalley-Tellura complex, 9 to 65 percent slopes
12	Comodore very stony loam, 25 to 65 percent slopes
13	Comodore-Rock outcrop complex, 40 to 65 percent slopes
14	Corlett-Hooper complex, 0 to 15 percent slopes
15	Costilla gravelly loamy sand, 0 to 3 percent slopes
16	Cotopaxi sand, 2 to 15 percent slopes
17	Crestvale loam
18	Cryaquolls and Histosols, nearly level
19	Decros loam, 1 to 15 percent slopes
20	Derrick very gravelly loam, 0 to 3 percent slopes
21	Des Moines gravelly clay loam, dry, 0 to 2 percent slopes
22	Duneland
23	Dunul very gravelly sandy loam
24	Garita gravelly loam, 0 to 3 percent slopes
25	Garita gravelly loam, 3 to 25 percent slopes
26	Garita-Platoro complex, 1 to 9 percent slopes
27	Gelkie loam, 3 to 25 percent slopes
28	Gerrard loam, 0 to 3 percent slopes
29	Graypoint gravelly sandy loam, 0 to 3 percent slopes
30	Gunbarrel loamy sand
31	Gunbarrel loamy sand, saline
32	Hegga loam, dry
33	Hepney clay loam
34	Harlem, dry-Slickspots complex
35	Hooper loamy sand
36	Hooper clay loam
37	Hopkins-Cheadle-Rock outcrop complex, 3 to 35 percent slopes
38	Humic Cryaquepts, nearly level, acid overwash
39	Jodero loam, 0 to 3 percent slopes
40	Jodero-Lolo, wet complex, 0 to 6 percent slopes
41	Kerber loamy sand
42	Laney loam, 0 to 3 percent slopes
43	Luhon loam, 0 to 3 percent slopes
44	Luhon loam, 3 to 6 percent slopes
45	McGinty sandy loam, 0 to 3 percent slopes
46	Medano fine sandy loam
47	Medano-Hepney complex
48	Monte loam, 0 to 3 percent slopes
49	Morvel clay loam, 3 to 6 percent slopes
50	Mosca loamy sand, 0 to 3 percent slopes
51	Mount Home-Saguache complex, 2 to 25 percent slopes
52	Norte gravelly sandy loam
53	Oursy-Sebe, dry complex, 9 to 25 percent slopes
54	Parlin gravelly loam, 3 to 35 percent slopes
55	Platoro loam, 0 to 3 percent slopes
56	Platoro cobbly loam, 3 to 9 percent slopes
57	Rock outcrop, steep
58	Rock River gravelly loam, 3 to 15 percent slopes
59	Rock River gravelly loam, 15 to 25 percent slopes
60	Saguache gravelly sandy loam, 0 to 1 percent slopes
61	Saguache gravelly sandy loam, 3 to 9 percent slopes
62	San Arcacio sandy loam
63	San Luis sandy loam
64	San Luis sandy loam, drained
65	Schrader sandy loam, 0 to 3 percent slopes
66	Seitz very stony loam, 15 to 65 percent slopes
67	Seitz very stony loam, warm, 15 to 65 percent slopes
68	Sessions loam, 9 to 35 percent slopes
69	Shawa loam, 0 to 4 percent slopes
70	Space City loamy sand, 0 to 6 percent slopes
71	Space City loamy sand, saline, 0 to 3 percent slopes
72	Space City-Hooper complex, 0 to 15 percent slopes
73	Tolman, dry-Rock outcrop complex, 9 to 65 percent slopes
74	Torsido loam, 0 to 1 percent slopes
75	Torsido-Gerrard complex, 0 to 3 percent slopes
76	Travelers very stony loam, 3 to 35 percent slopes
77	Travelers-Garita complex, 6 to 35 percent slopes
78	Uracca very cobbly loam, 15 to 45 percent slopes
79	Vastine loam
80	Vastine loam, alkali
81	Villa Grove sandy clay loam
W	Water

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline
- AD HOC BOUNDARY (label) (Medic Airstrip)
- Small airport, airfield, park, oilfield, cemetery, or flood pool (FLOOD POOL LINE)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate (21)
- Federal (173)
- State (28)
- County, farm or ranch (1283)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water, w)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (Gas)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water, w)
- Intermittent (int, i)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (CnB, WaC2)

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

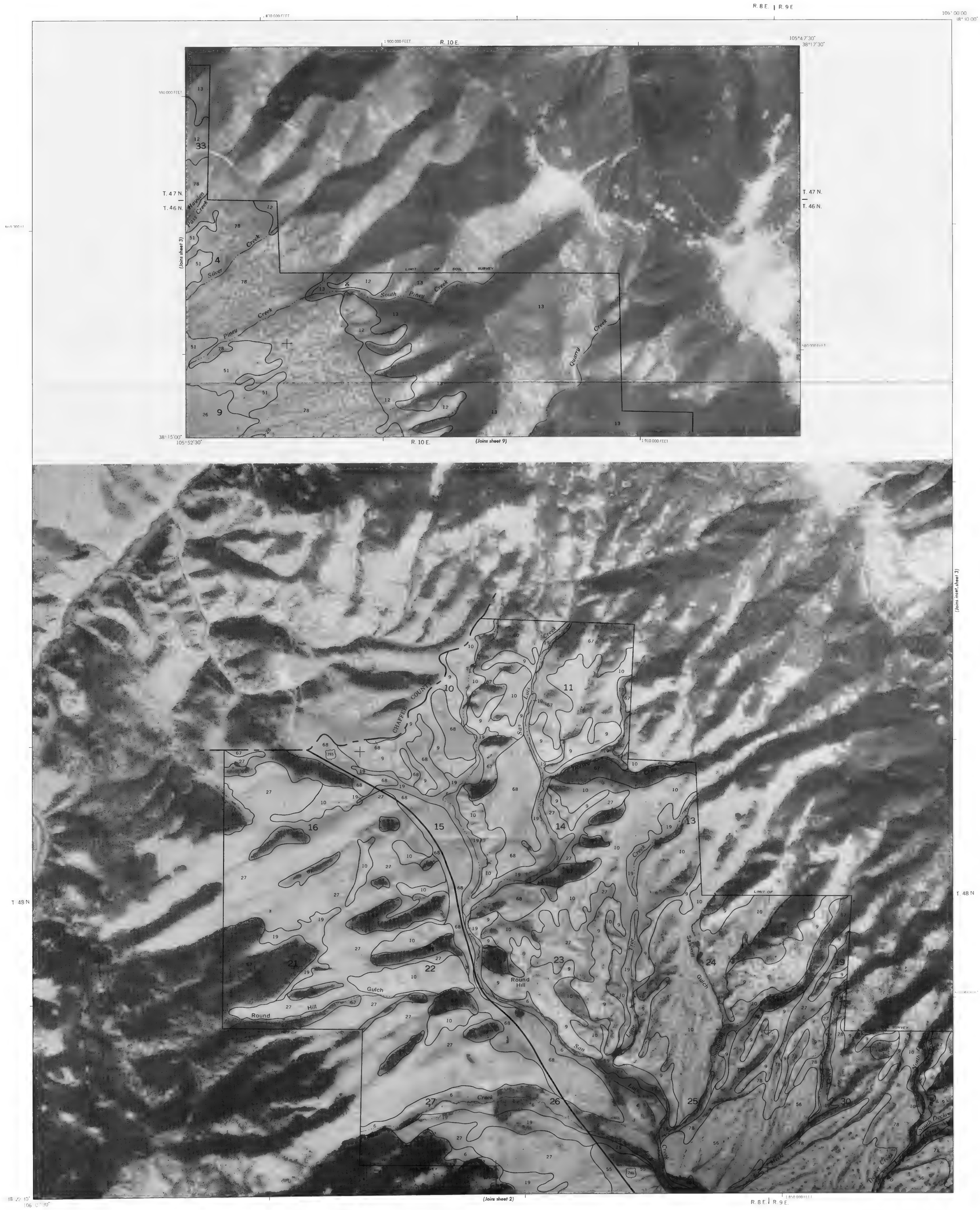
GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot



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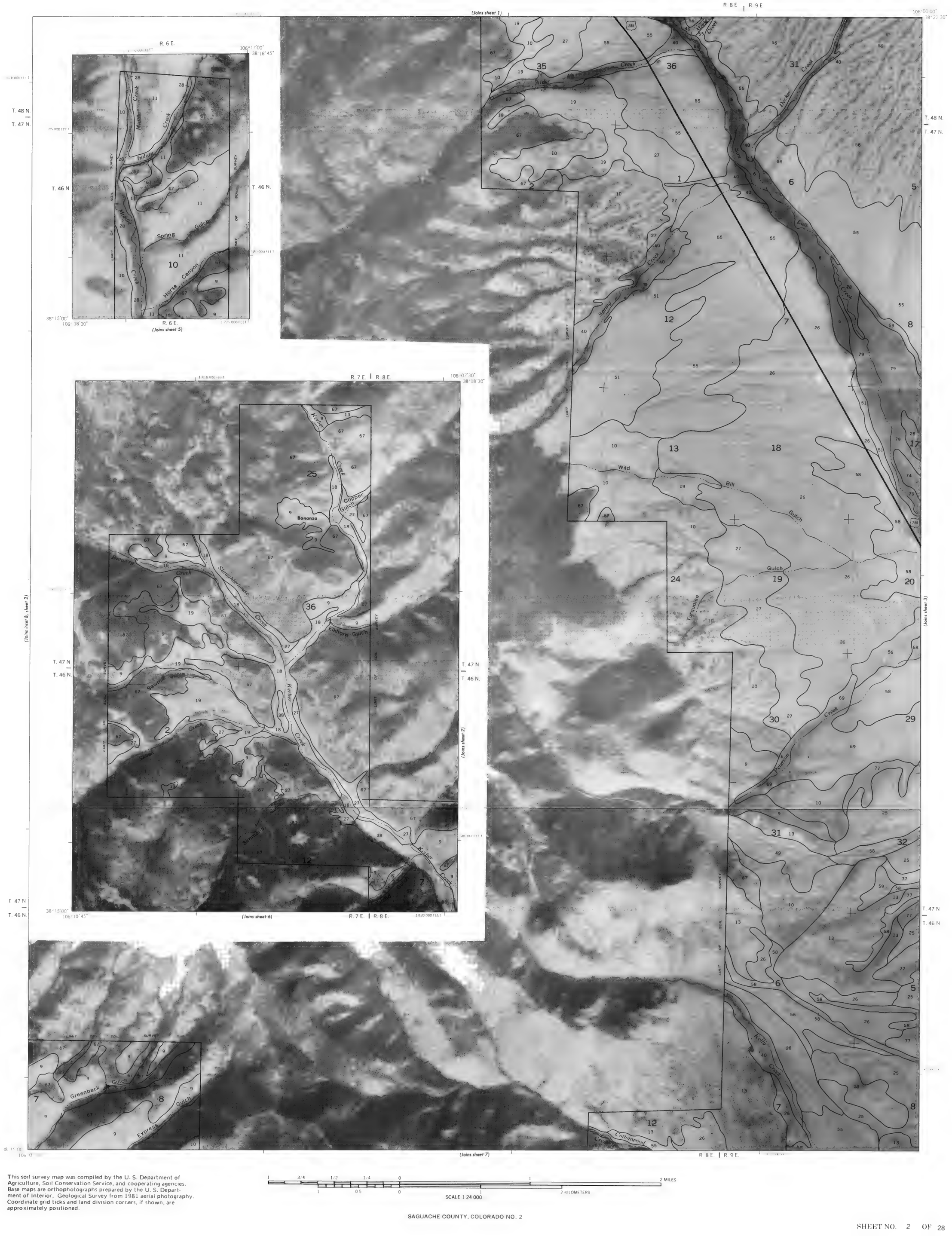
1 3/4 1/2 1/4 0 1 2 MILES
1 0 1 2 KILOMETERS
SCALE 1 24 000

SAGUACHE COUNTY, COLORADO NO. 1

SHEET NO. 2
SOIL SURVEY OF SAGUACHE COUNTY AREA, COLORADO
(WHALE HILL QUADRANGLE)



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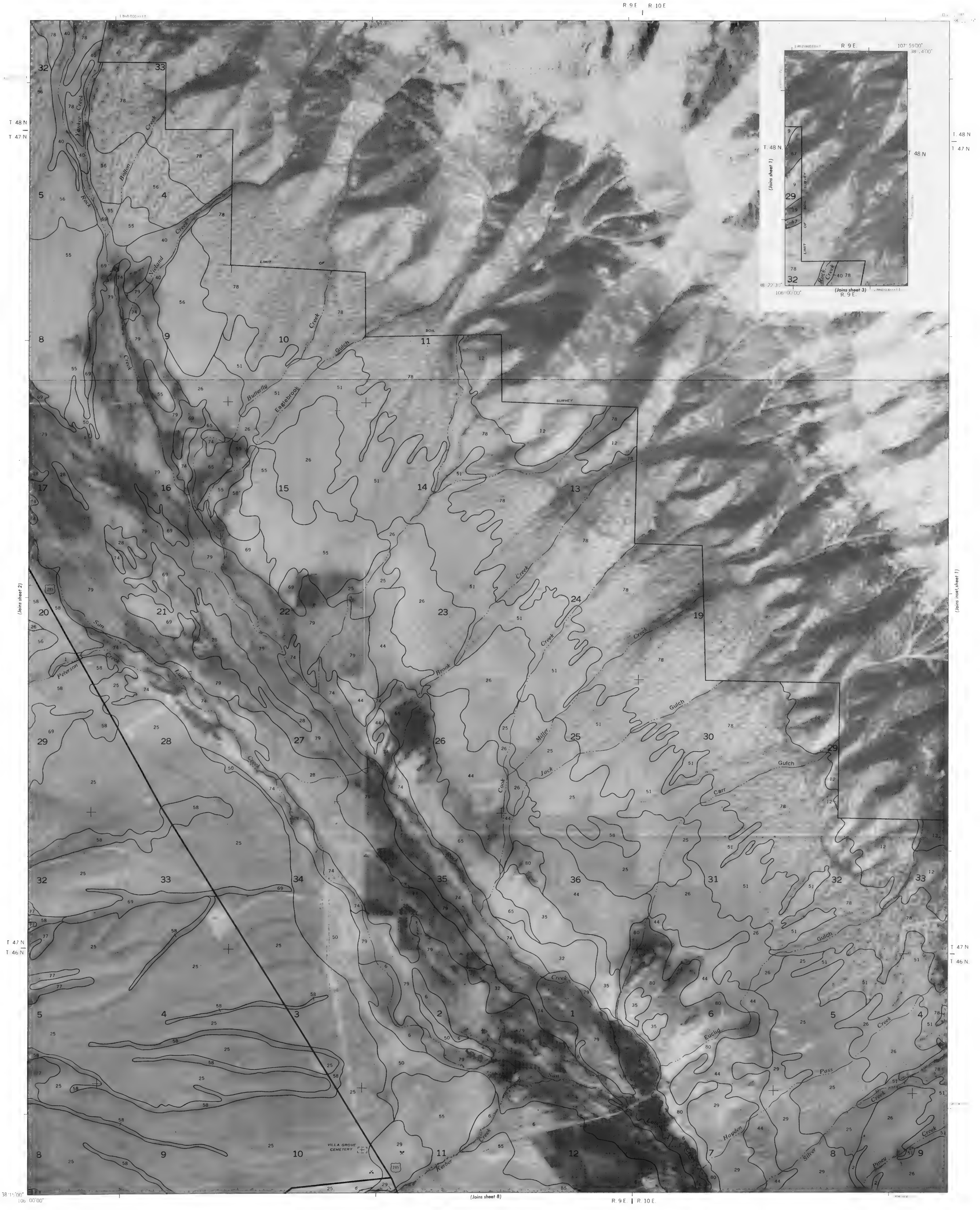
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

SAGUACHE COUNTY, COLORADO NO. 2



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SAGUACHE COUNTY, COLORADO NO. 3

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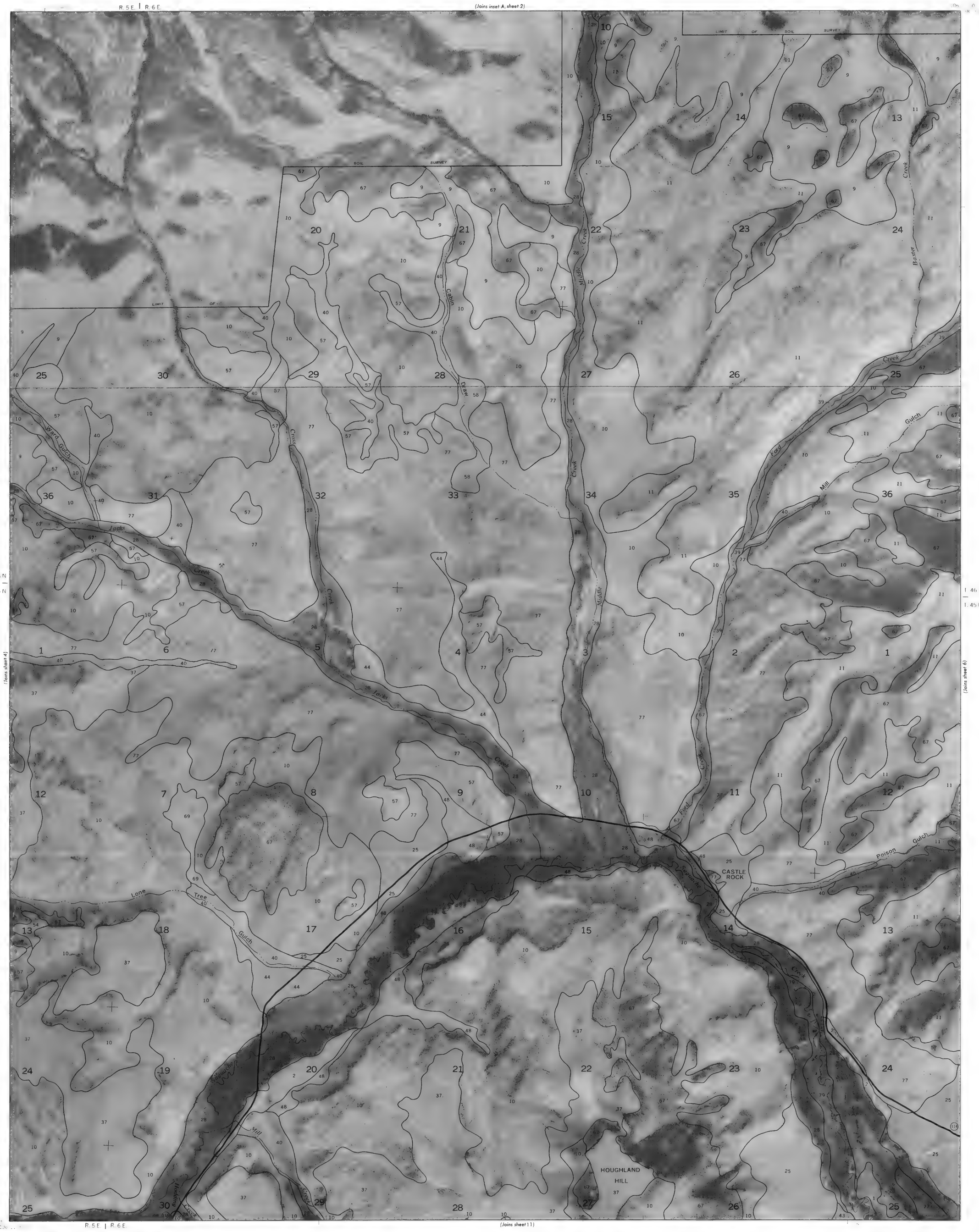
SCALE 1 24 000

SAGUACHE COUNTY, COLORADO NO. 4



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1 3/4 1 1/2 1 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

SAGUACHE COUNTY, COLORADO NO. 5

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1 3.4 1/2 1.4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1 24 000

SAGUACHE COUNTY, COLORADO NO. 6

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SAGUACHE COUNTY, COLORADO NO. 7

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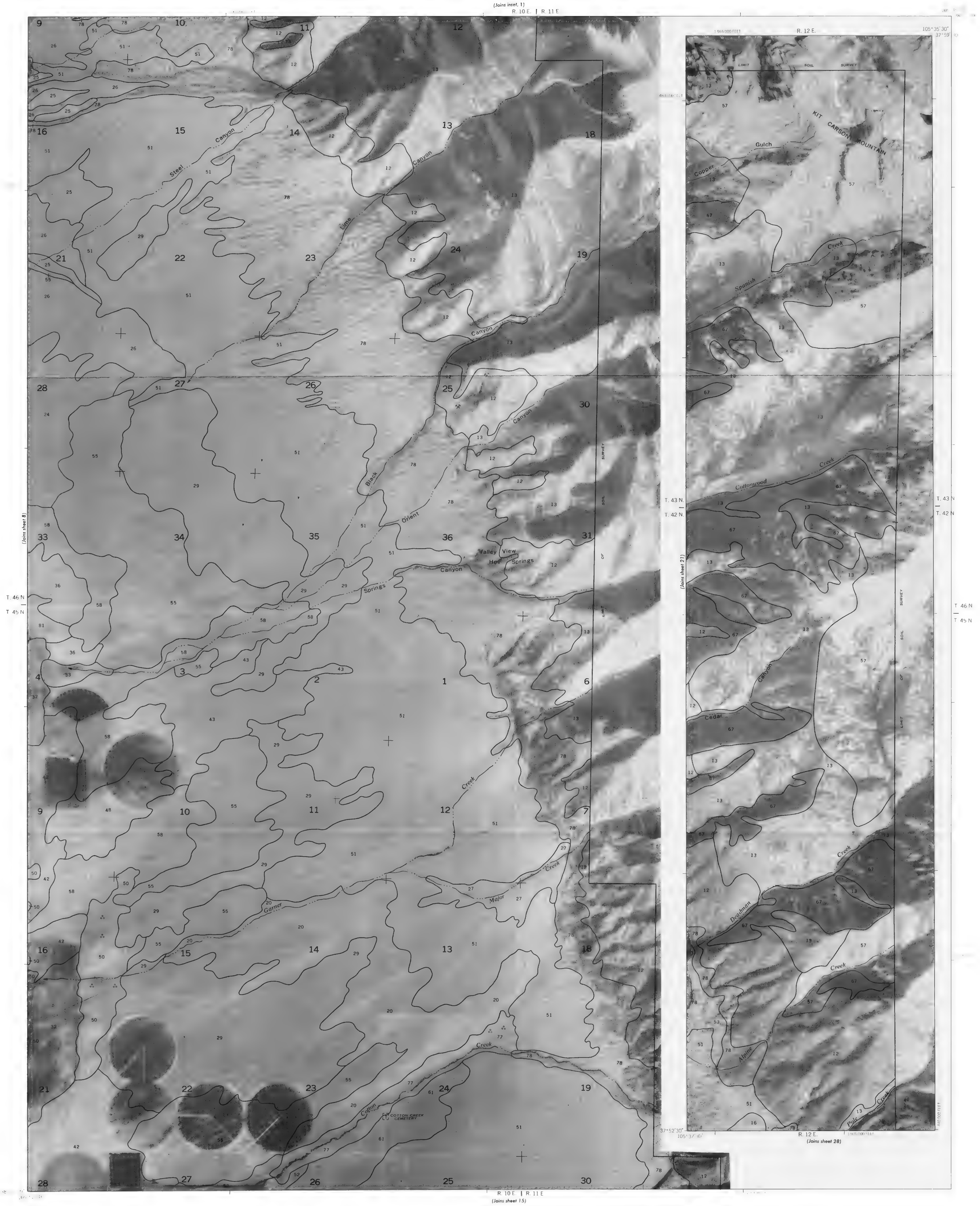
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

SAGUACHE COUNTY, COLORADO NO. 8



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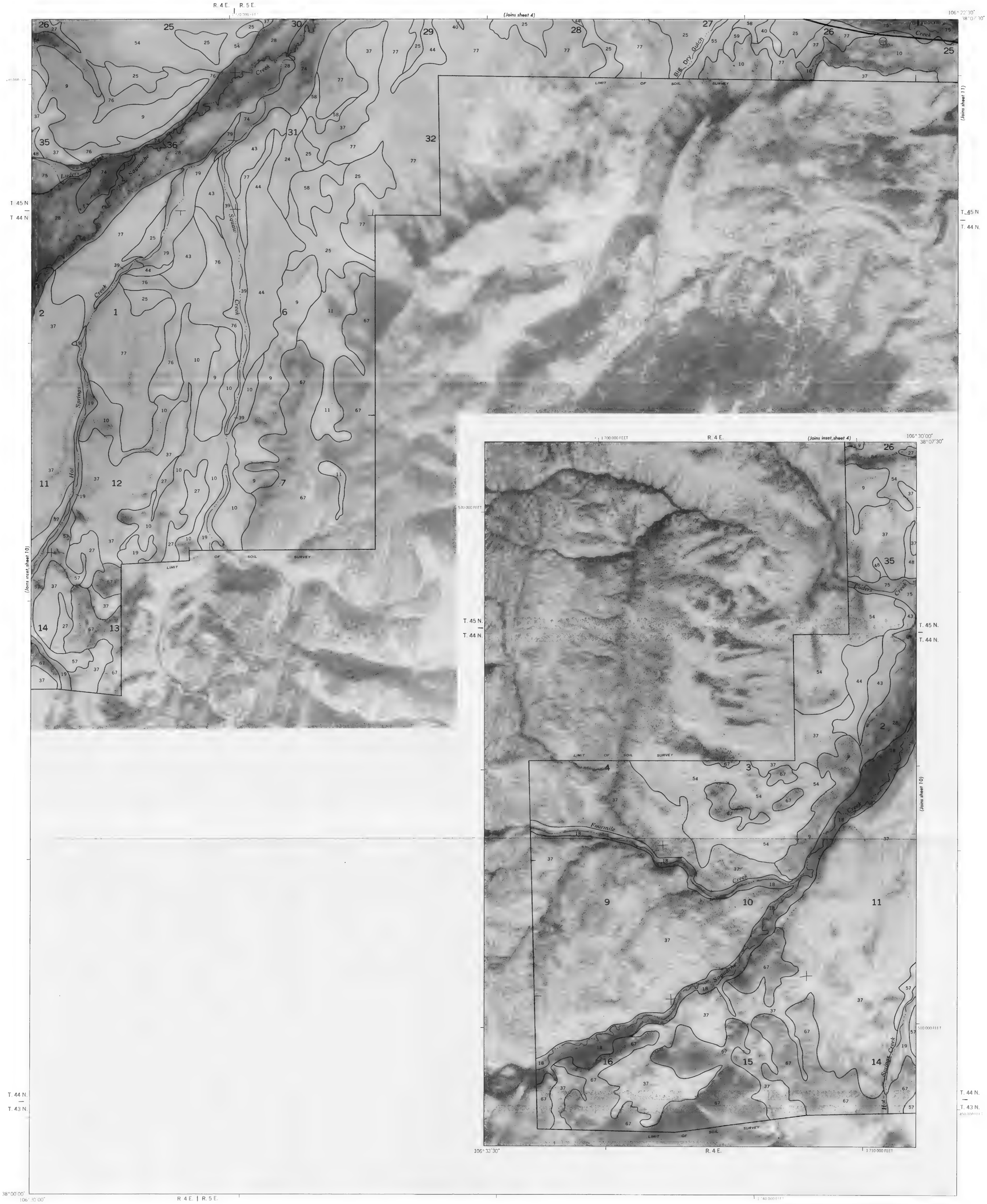
1 0 5 0 1 2 KILOMETERS
SCALE 1:24 000

SAGUACHE COUNTY, COLORADO NO. 9



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1 3/4 1/2 1/4 0 1 2 MILES
1 0 5 0 1 2 KILOMETERS
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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

SAGUACHE COUNTY, COLORADO NO. 11

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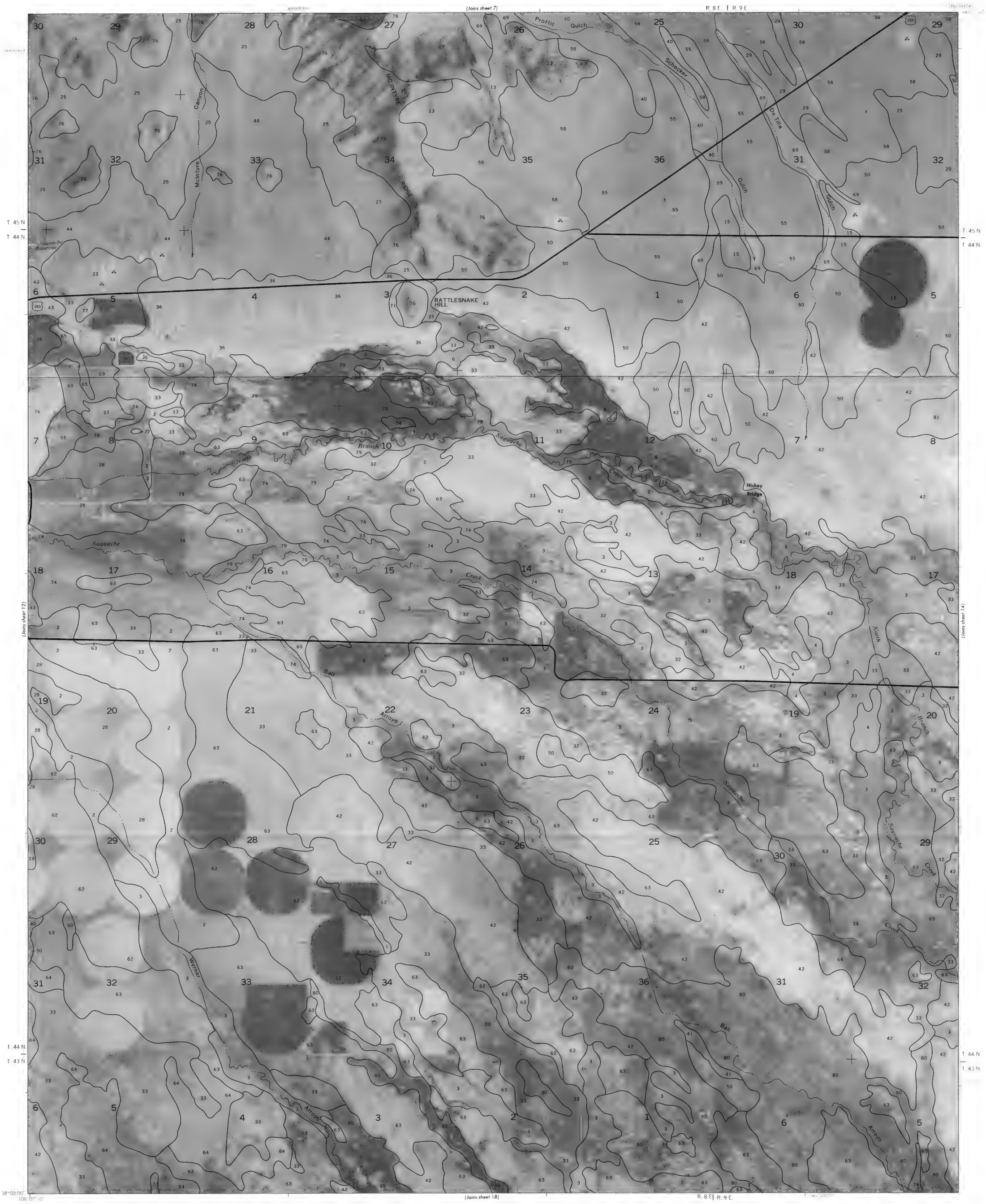
SCALE 1:24 000

SAGUACHE COUNTY, COLORADO NO. 12



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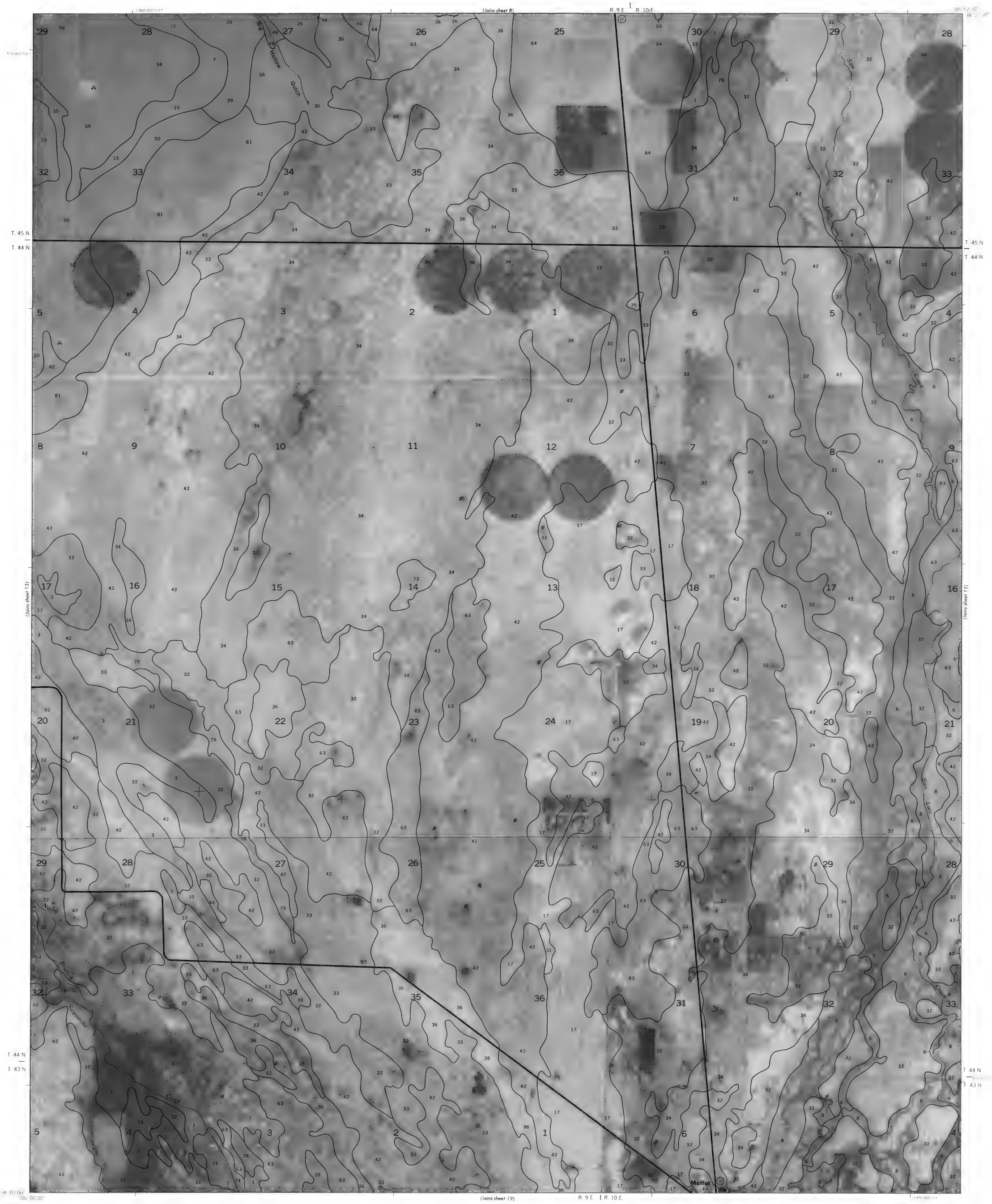
SCALE 1 24 000

SAGUACHE COUNTY, COLORADO NO. 13



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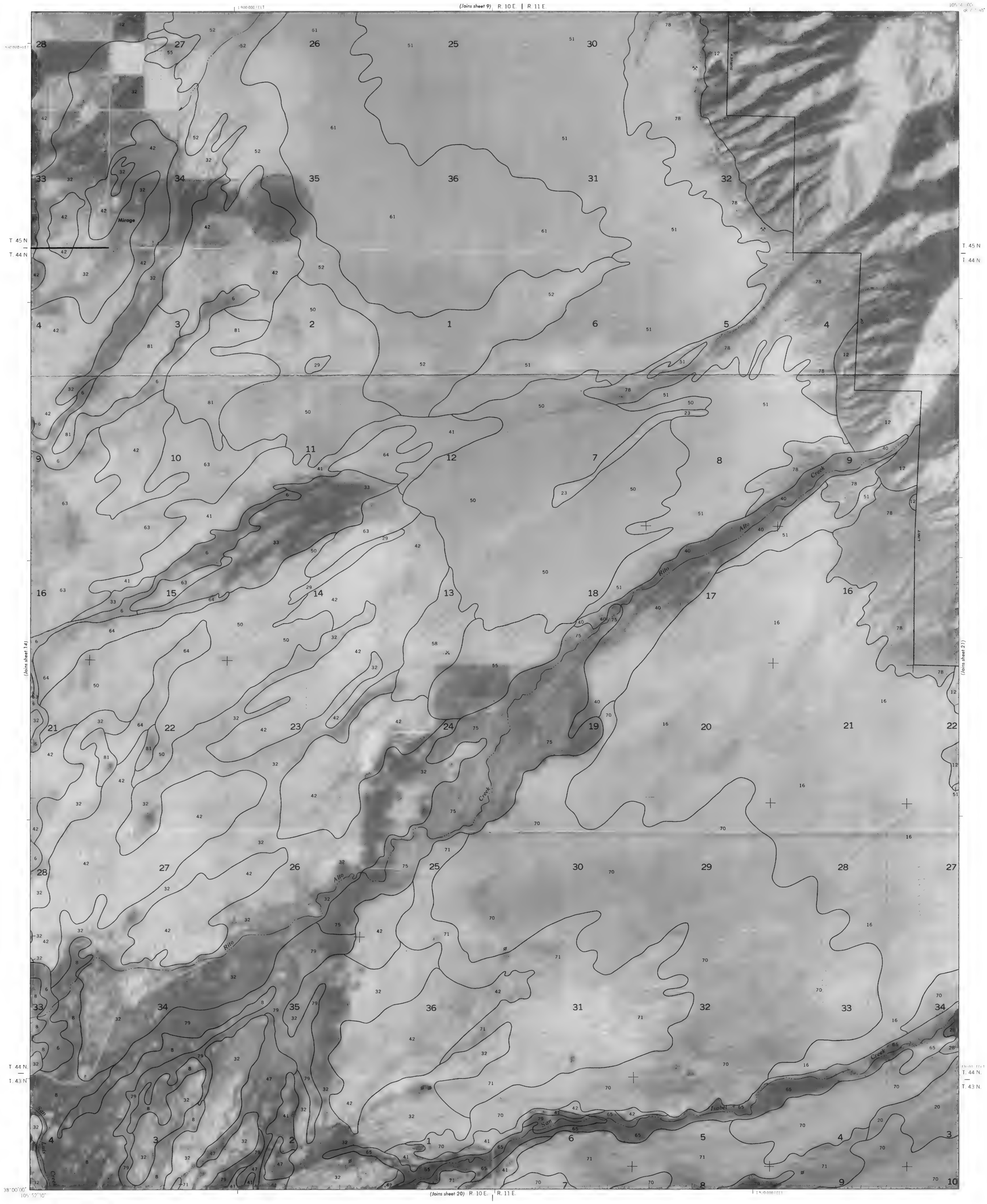
SCALE 1:24 000

SAGUACHE COUNTY, COLORADO NO. 14



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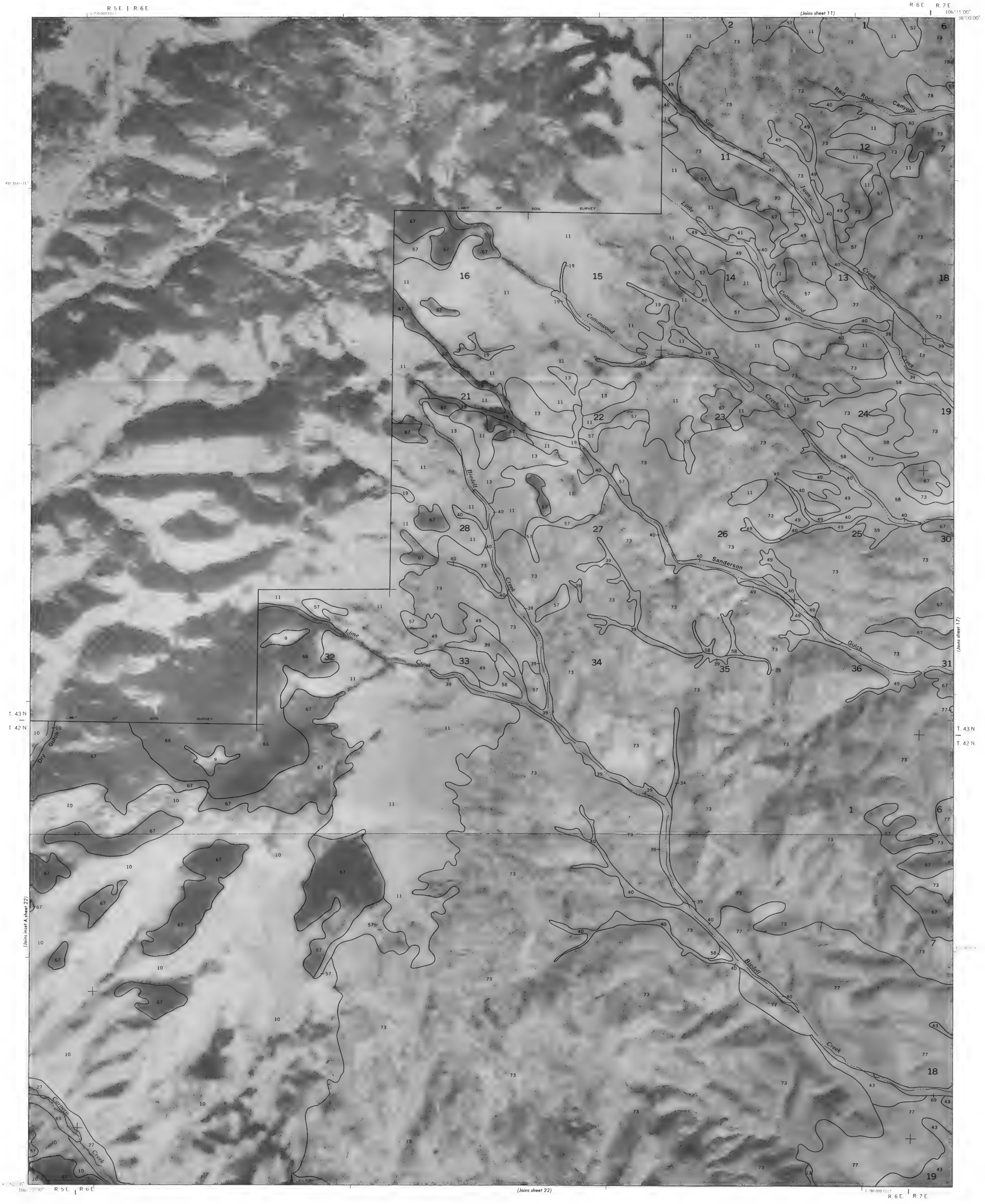
SAGUACHE COUNTY, COLORADO NO. 15



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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

SAGUACHE COUNTY, COLORADO NO. 16

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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

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1 3/4 1/2 1/4 0 1 2 MILES
1 0 5 0 1 2 KILOMETERS
SCALE 1:24 000

SAGUACHE COUNTY, COLORADO NO. 18

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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

SAGUACHE COUNTY, COLORADO NO. 19

R. 10 E. R. 11 E.
(Joins sheet 15)

T. 43 N.

T. 42 N.

(Joins sheet 19)

(Joins sheet 21)

(Joins sheet 26)

R. 10 E.

Creek
San Luis
Creek
San Isabel
Creek
Creek
Crestone
Creek
Creek
Willow
Creek
Creek
Spanish
Creek
Cottonwood
Creek
Deadman
Creek
Saguache
Creek
Wiesman Lake
Cottonwood Camp
water

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1 3/4 1/2 1/4 0 1 2 MILES
1 0 5 0 1 2 KILOMETERS
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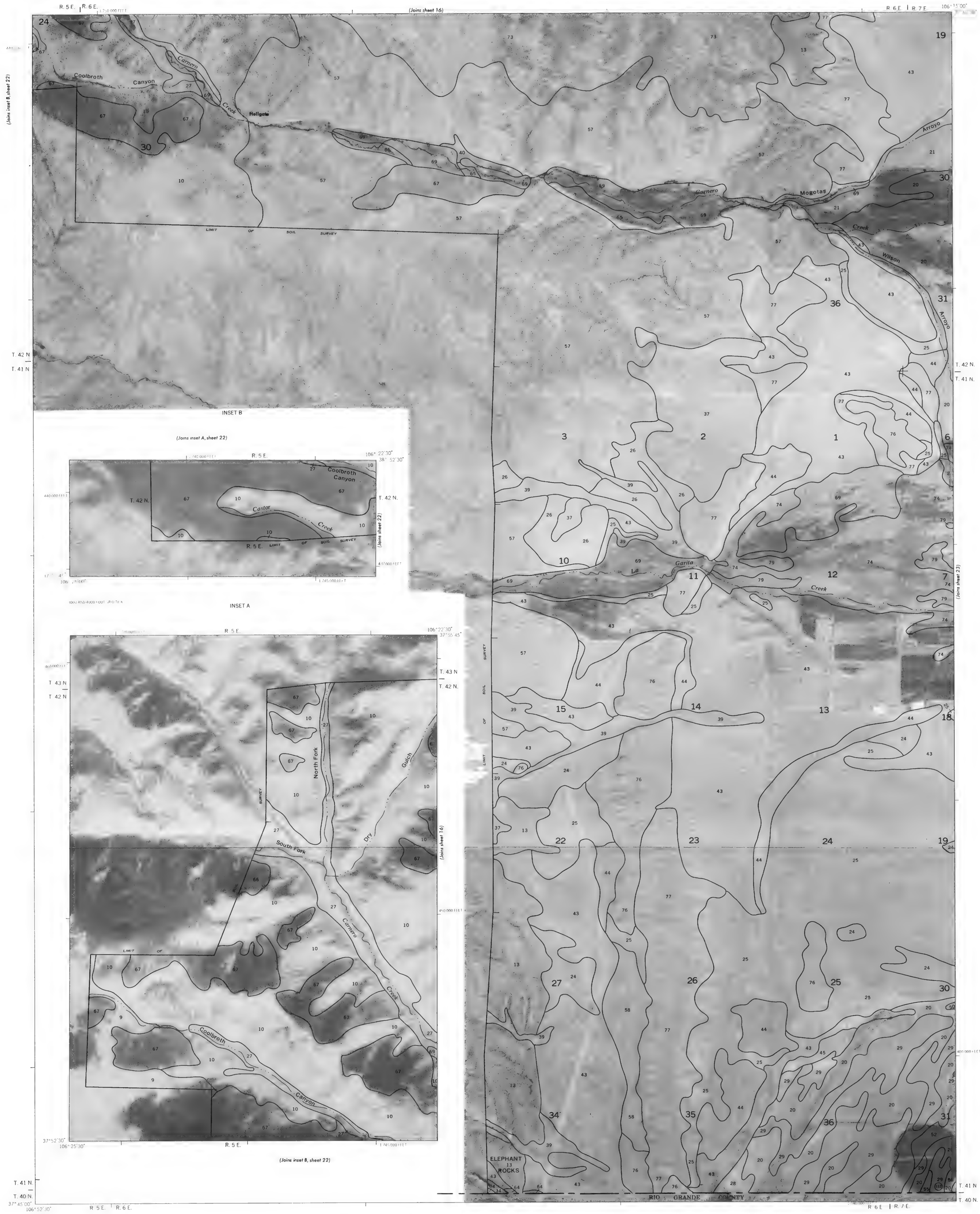
1 0 5 0 1 2 KILOMETERS
SCALE 1:24 000



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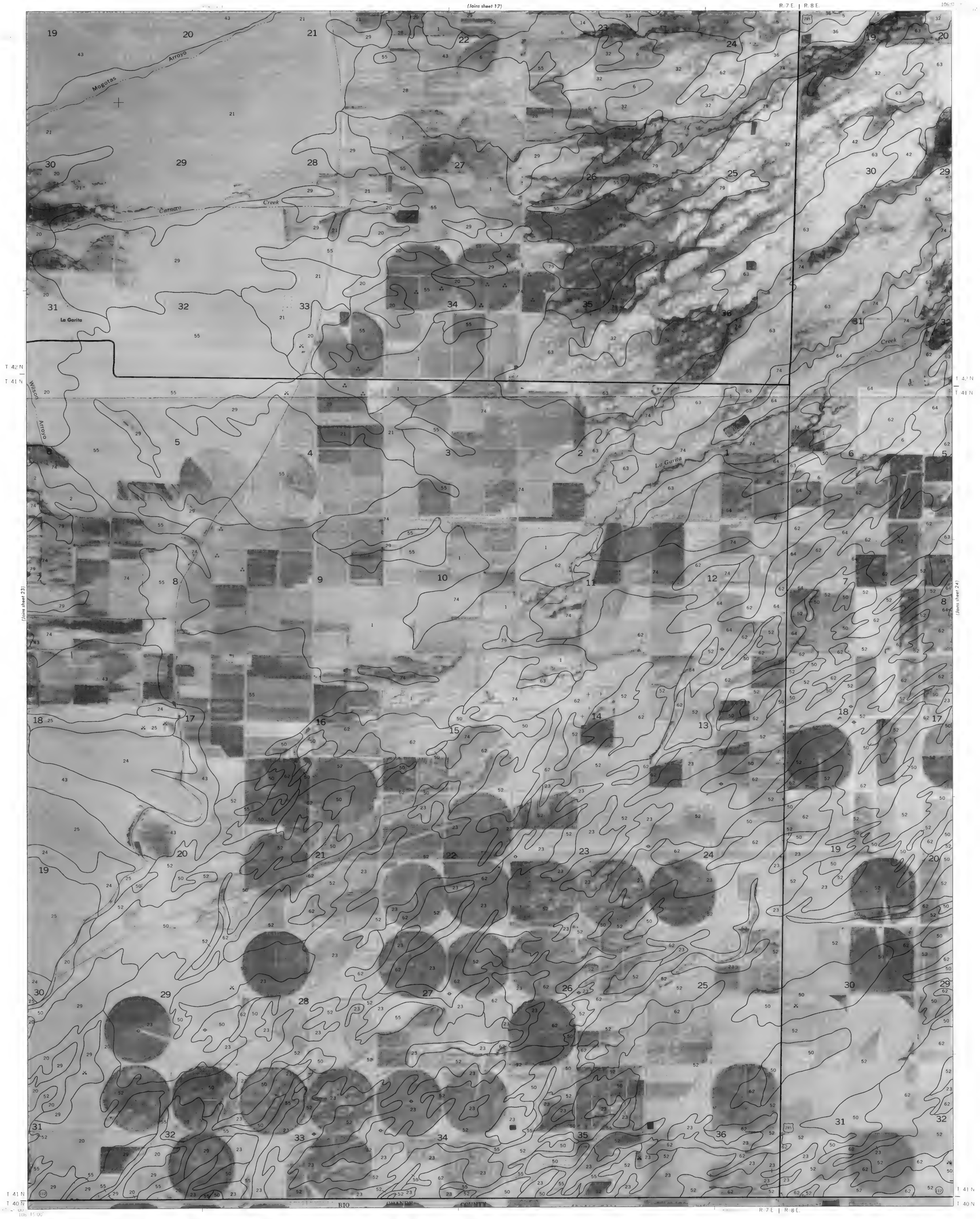
SCALE 1:24 000



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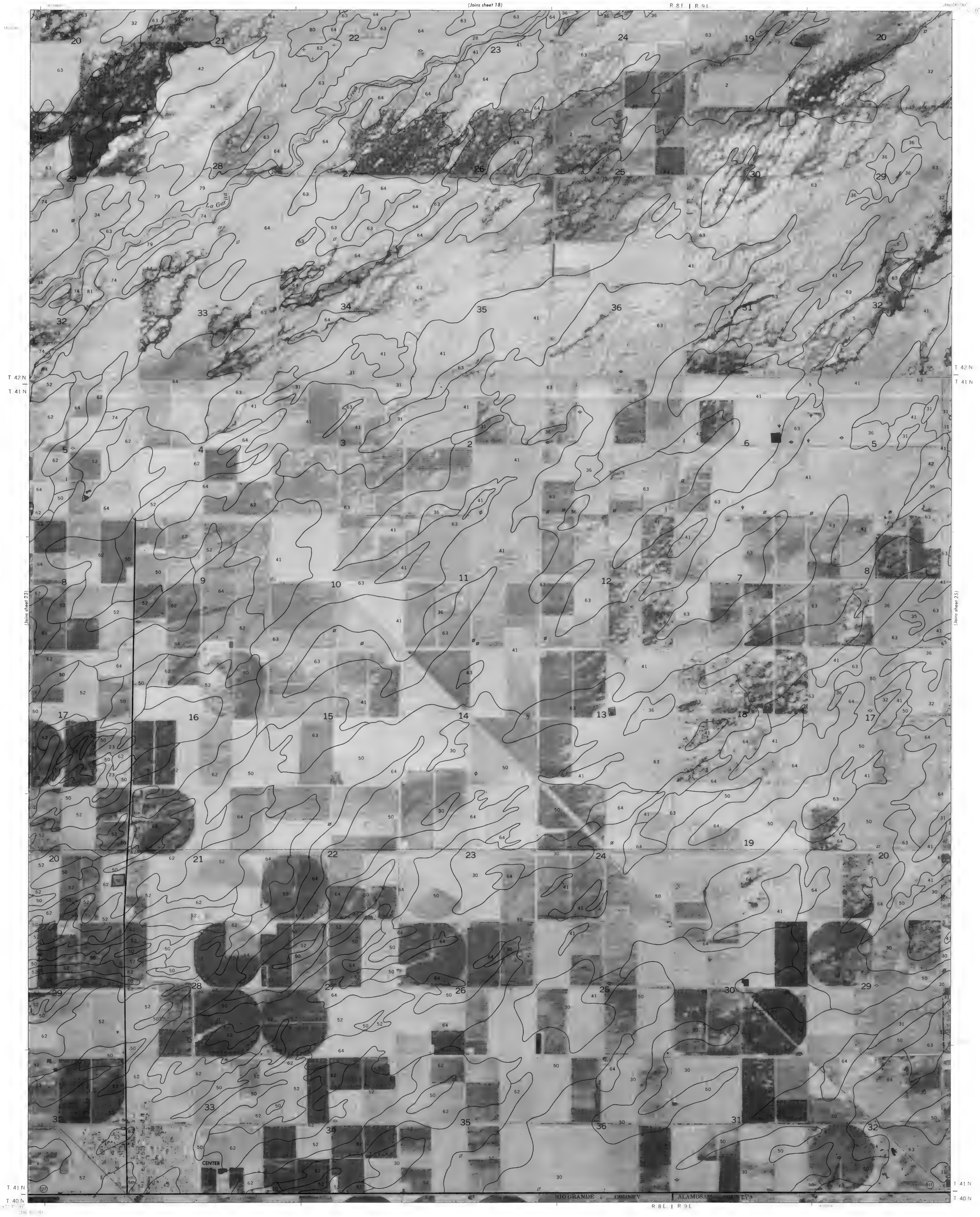
1 3/4 1 1/2 1 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

SAGUACHE COUNTY, COLORADO NO. 23

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO.24
SOIL SURVEY OF SAGUACHE COUNTY AREA, COLORADO
(CENTER NORTH QUADRANGLE)



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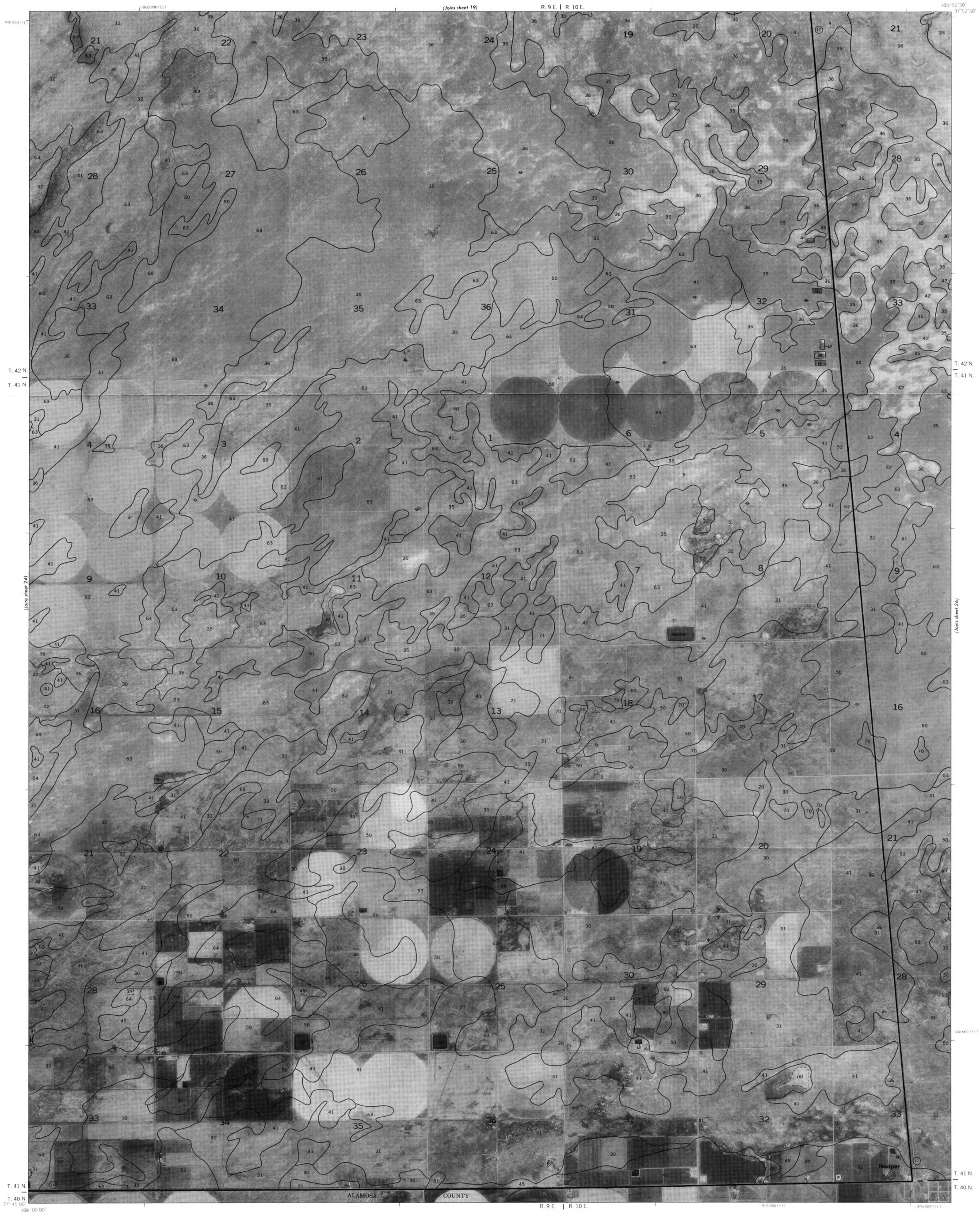
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

SAGUACHE COUNTY, COLORADO NO. 24



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1 3/4 1/2 1/4 0 1 2 MILES
1 0 5 0 1 2 KILOMETERS
SCALE 1:24 000

SAGUACHE COUNTY, COLORADO NO. 25

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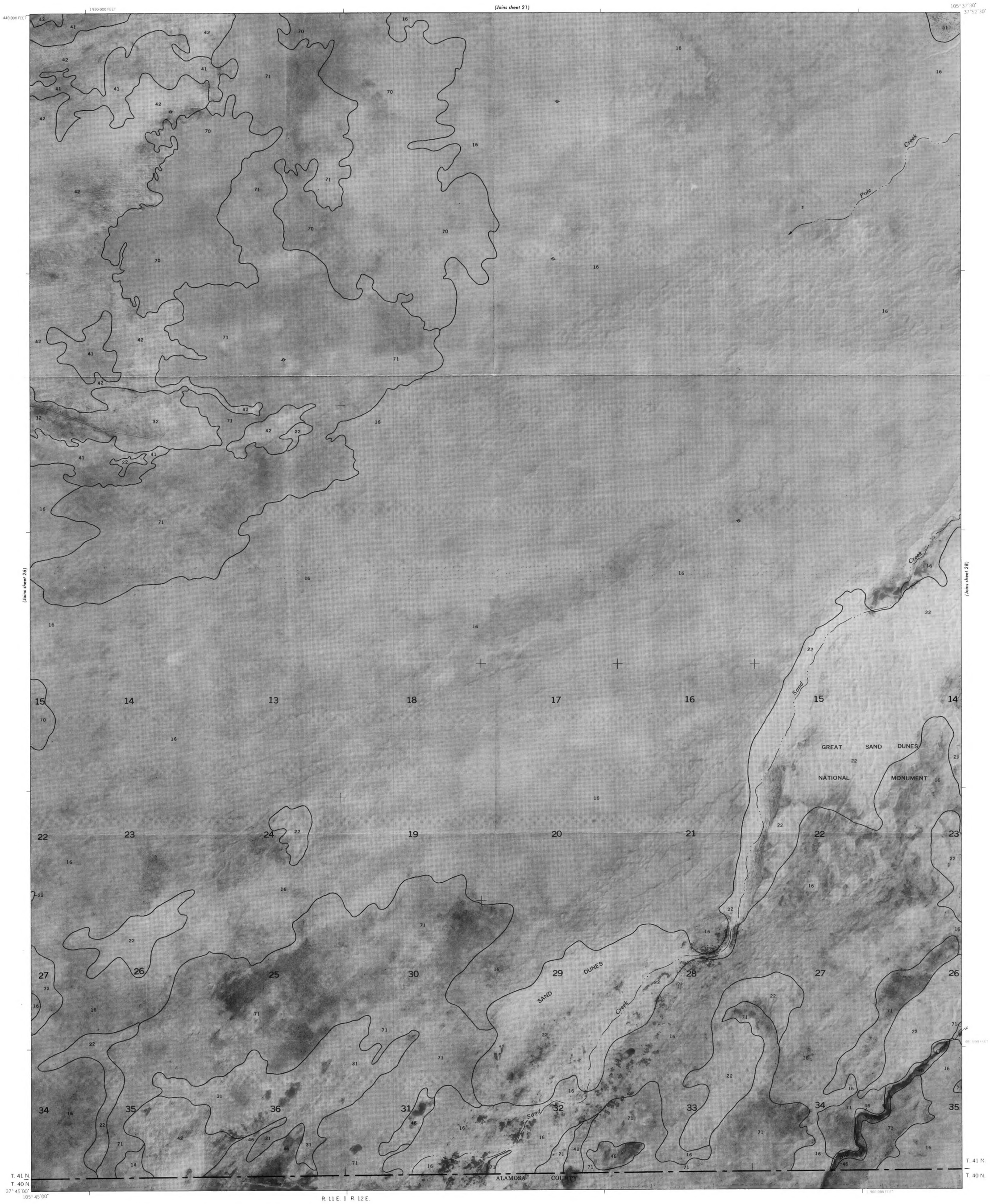
1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

SAGUACHE COUNTY, COLORADO NO. 26



This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

SAGUACHE COUNTY, COLORADO NO. 27

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

SAGUACHE COUNTY, COLORADO NO. 28